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ECONOMICS OF CLIMATE CHANGE: KEY MESSAGES

Policy Brief[1]

By Paul Watkiss[2]. .

How vulnerable is Africa today?

- Africa has high existing vulnerability. This arises from developmental challenges (including poverty, complex governance, high population growth, a high burden of disease, etc.), high levels of current ecosystem degradation and loss of natural resources, and existing extreme climates which lead to regular disasters related to floods and droughts. It also has low adaptive capacity – and a current adaptation deficit.
- Climate variability already has significant economic costs in Africa, with periodic floods and droughts already causing major macro-economic costs, long-term fiscal liabilities and reductions in economic growth. For example, in East Africa, major periodic drought and flood events have been found to have economic costs of 5% to 8% GDP per event, and because of their regular frequency, have a direct long-term fiscal liability of over 2% GDP per annum.

What climate conditions might be expected in the future?

- Climate change is now being observed and measured globally and in Africa. Average global temperatures have risen by almost 0.8ºC over the last century, and slightly higher than this in Africa, with a particularly sharp rise over last 50 years rise. There have also been rises in sea level, and changes in the pattern of rainfall, extreme rainfall (floods) and droughts. These trends are very real and are accelerating.
- The rate of change will increase over the next 50 years, probably by more than twice as much as over the entire 20th century. By 2050, average temperatures in Africa are predicted to increase by 1.5 to 3ºC, and will continue further upwards beyond this time. There will also be major changes in rainfall in terms of annual and seasonal trends, and extreme events of flood and drought, though there is wide variation amongst projections. Nonetheless, the overall scale of the change will be dramatic. As an illustration, the current climate of Kigali would be replaced with dramatically hotter and potentially wetter conditions.

What are the potential costs of climate impacts, within the current outlook of development plans?

- Future climate change will also lead to potentially large impacts and economic costs. While these effects occur globally, Africa is particularly at risk (vulnerable), due to the large number of areas prone to existing floods and droughts, the number of regions that are already close to tolerance limits in terms of heat or water availability, and low adaptive capacity.
- Africa-wide assessments of the economic costs of potential climate impacts are in progress, though they have not been adequately reviewed. However, the emerging message is clear: recent and future changes have dramatic economic consequences.
- An indication of the potential scale of the economic costs of climate change in Africa can be derived from global integrated assessment models (IAMs). These provide highly aggregated information on potential economic costs using a framework that links emissions, climate change and impacts on the economy, though they use simplified relationships to do this and are not able to capture all of the effects of climate change. Nonetheless, they indicate the potential scale of costs:
    - The PAGE model, used in the Stern review, estimates climate change will lead to an equivalent annual loss in GDP in Africa of just under 2% by 2040 (including market and non-market sectors, with no adaptation). However, this is probably a lower bound, and the upper range from the model is a 4% GDP annual loss by 2040.
    - The FUND model, another leading global IAM, estimates that climate change will lead to an equivalent annual loss in GDP in Africa of 2.7% by 2025. The results show large economic costs from change in water resources, health impacts, and energy costs for cooling, but some potential benefits for agriculture. The results show differences in these costs by region, with greater initial impacts in Sub-Saharan Africa compared to North Africa.
- Assessment of sectoral model results across Africa, at the continental, country or sub-national scale, show concerns in relation to rising sea levels and storm surge risk in coastal regions, a greater potential burden of health, a rise in potential demand for energy for cooling, and in some regions, potential increased risks to infrastructure from extreme events, declines in water resource availability, and significant falls in agricultural yields. All of these involve significant economic costs. There are also increasing threats to biodiversity and associated ecosystem services. A summary is shown below.

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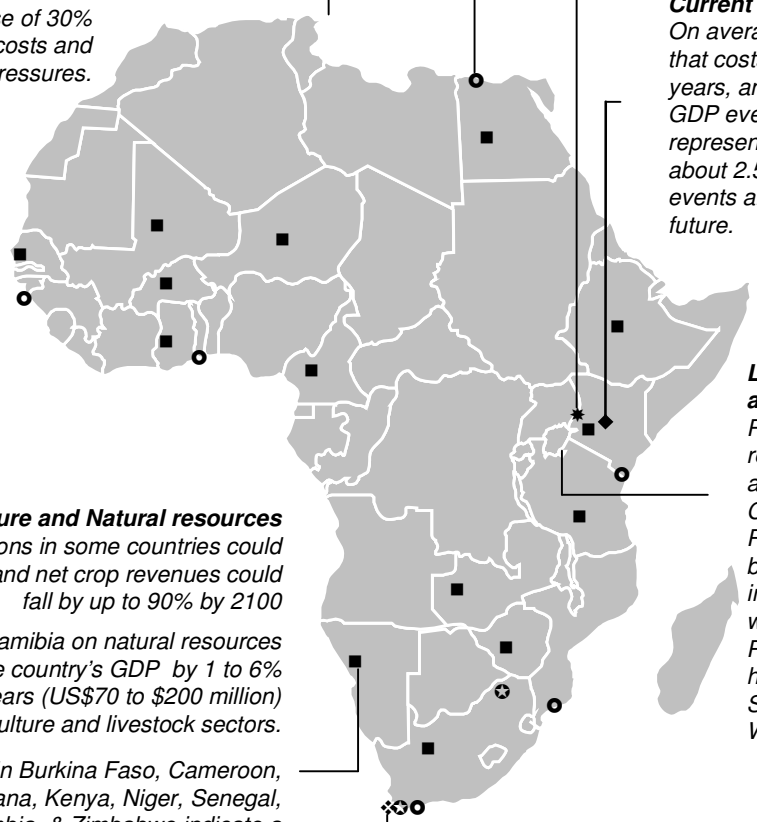
[2] Note that funding for the underpinning economic impacts studies have been provided by DFID, DANIDA and UNEP

Coastlines. Sea level rise.
Number of people at risk from coastal flooding could increase from 1 million in 1990 to 70 million in 2080. Estimates of economic costs of up to 0.5% of GDP

Studies in Egypt (Alexandria), Kenya (Mombasa), Benin (Cotonour), Mozambique, ,Guinea Bissau and the Western Cape, reveal high levels of land and populations at risk of flooding, risks of erosion, and potentially high economic costs

Health. Burden of disease. *WHO estimates climate change already attributed with causing 55000 deaths and 2 million DALY each year, and significant increases in rates of vector (*1.14) and diarrhoeal disease (*1.08) by 2030. Studies show spread of maleria to higher latitudes in East African highlands. Potential for heat extremes to affect health and productivity.*

Cooling demand / energy costs
Rising temperatures will increase cooling demand. Information across Mediterranean countries indicates a potential rise of 30% by 2030. Rising energy costs and peak supply pressures.



Current and future climate variability.
On average, Kenya experiences a flood that costs ~5.5 % of GDP every seven years, and a drought that costs ~8 % of GDP every five years, which together represent a long-term fiscal liability of about 2.5 % GDP per annum. These events are predicted to increase in the future.

Loss of ecosystem services - forests and reduced tourism potential
Recent loss/bleaching of coral in Kenya resulted in reduced tourism and losses of about US$12-18 million. Anticipated
Coastal tourism and corals
Potential impacts on wildlife – potentially between 25 and 40% of mammal species in national parks in sub-Saharan Africa will become endangered
Predicted reduction in biodiversity hotspots, such as the Fynbos and Succulent Karoo Biomes in South Africa, With species loss as high as 30%

Agriculture and Natural resources
Projected yield reductions in some countries could be up to 50% by 2020 and net crop revenues could fall by up to 90% by 2100

Impacts of CC in Namibia on natural resources alone could reduce the country's GDP by 1 to 6% over 20 years (US$70 to $200 million) predominantly in agriculture and livestock sectors.

Ricardian studies in Burkina Faso, Cameroon, Egypt, Ethiopia, Ghana, Kenya, Niger, Senegal, South Africa, Zambia, & Zimbabwe indicate a potential fall in net revenues from farming in all of Africa of $23 billion with 2.5℃ of temperature change. Estimates by country show varying effects, according to future trends.

Ongoing studies in Tanzania, Ethiopia, Mali

Water resources
About 25% of Africa's population (about 200 million people) currently experience high water stress. The population at risk of increased water stress in Africa is projected to be between 75-250 million and 350-600 million people by the 2020s and 2050s, respectively
Particular concerns for Northern Africa, but also regional pockets, e.g. Western Cape, Arid lands in Kenya, etc.

Examples of potential economic effects across Africa

Sources: Agrawala et al, 2004: Awuor et al, 2007: Boko et al, 2007: Callaway et al 2006 : Confalonieri et al 2007 : Dossou et al 2007: Kabubo-Mariara and Karanja 2007; Kurukulasuriya and Mendelsohn 2006; McMichael et al, 2004 : Midgley et al, 2005: Mogaka et al, 2005 : Nicholls and Tol, 2006: Nicholls et al, 2007: Reid et al, 2007.

What are the potential economic costs on a longer time frame?

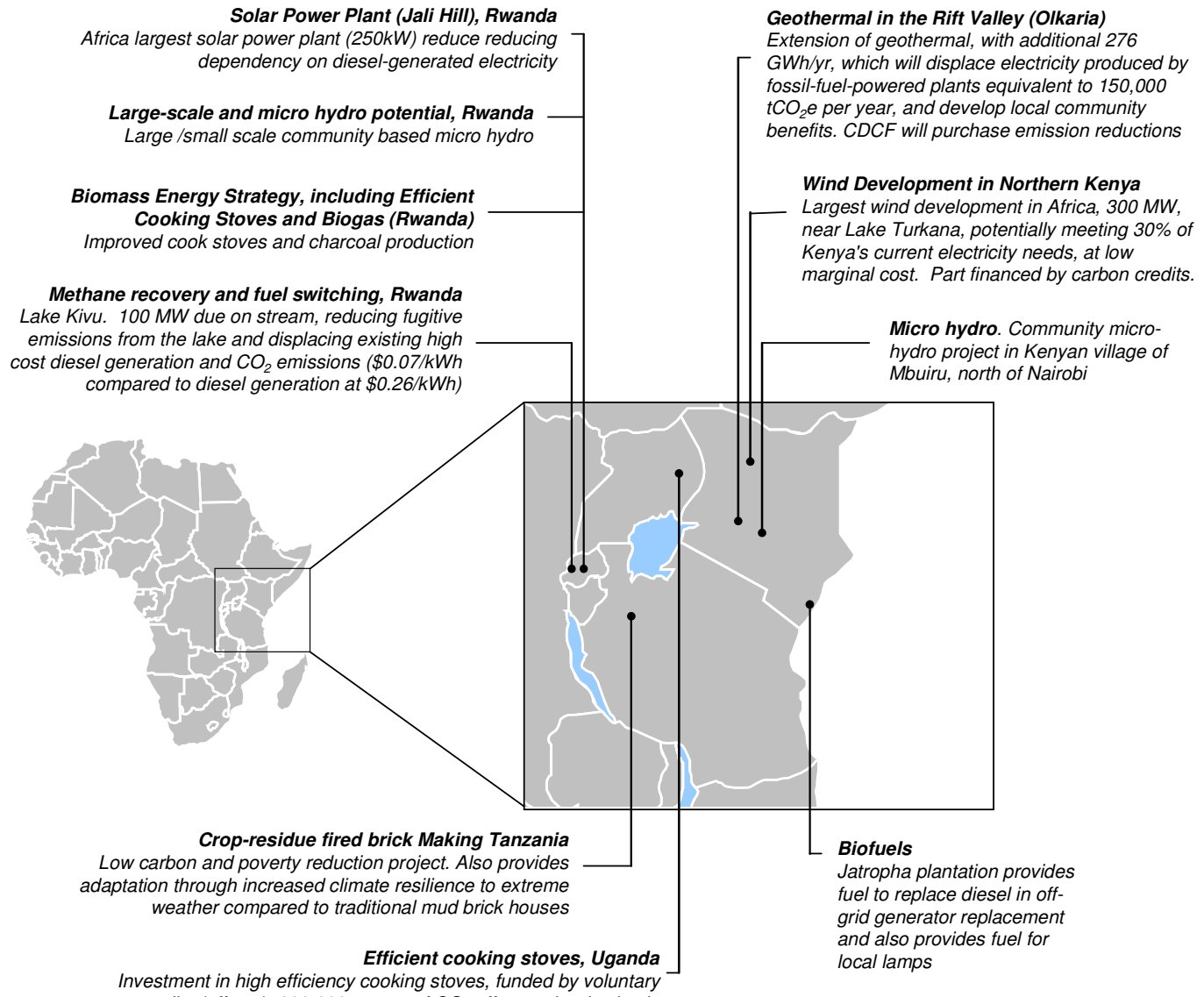
- The economic costs of climate change will potentially rise much more sharply in the longer term, especially in the absence of an international agreement on emissions. These long-term and large scale effects are difficult to estimate, and have strong interactions with development pathways as well as increasing uncertainty. Nevertheless, it is possible to explore the potential scale of effects.
    - The aggregated information from some IAMs shows very sharp rises in economic costs under a business as usual scenario. By 2100, the PAGE model estimates that climate change will lead to an equivalent annual loss in GDP in Africa of 10% by 2100 (including market and non-market sectors, without adaptation), with an upper value equivalent to an annual 25% GDP loss by 2100. Even at the lower level, economic impacts of this magnitude are unsustainable for a functioning economy.
    - Some of the sectoral assessment indicate similar increases in impacts and associated economic costs. *These will follow – we are just waiting for some sectoral results, e.g. DIVA results, plus compiling information from other sectors, and highlighting a message about the limits of adaptation*

What are the costs and benefits of adaptation?

- Adaptation can reduce the economic costs of climate change, though it can not remove them completely. However, adaptation is not free and evidence is only starting to emerge on the costs and benefits. These estimates vary significantly, and there are few validated studies, inconsistent assumptions and incomplete coverage, but they provide a possible bounded range of the indicative costs for adaptation financing for Africa.
    - The National Adaptation Programmes of Action in Africa identified urgent adaptation needs to avoid impacts especially in agriculture and the water sector, and also for health, coastal zones and extreme events. Estimates of the African NAPAs that cite costs (Burundi, Comoros, Congo, Djibouti, Eritrea, Guinea, Lesotho, Madagascar, Malawi, Mauritania, Rwanda, Senegal, Sudan, Tanzania, Uganda, and Zambia) are mostly in the range $5 million to $20 million. Together they total $300 million.
    - Recent top-down approaches have looked at the necessary additional financing needed on current investment (ODI, FDI, DFI) to include an adaptation component. One estimate of the global cost of 'climate-proofing' new investments in developing countries is US$10–40 billion per year, and using a similar approach, the WB, AfDB and UNECA estimate an annual cost of US$2–7 billion for Africa alone (around 0.5% of Africa's GDP). The AfDB also estimates it will need additional resources of US$300 million/year just to safeguard the effectiveness of new AfDB/African Development Fund (ADF) investments.
    - Other top down approaches have derived values for Africa, for example using a similar approach to UNFCCC approach, and estimating the proportion of funds (across ODA and concessional finance, FDI, DFI, AfDB new approvals, and ADF new approvals) that are sensitive to climate change, the percentages of adaptation cost (from the Stern Review (2006) and AfDB (2007)), and the data of total investment inflows reported in AfDB (2007). On this basis, the total adaptation costs of Africa are estimated to be US $0.8 to 6.3 billion per year.
    - Work for the African Ministerial Conference on Environment has identified the need for early priorities and funding for assessing vulnerability, building capacity, and piloting adaptation, before then moving to operational adaptation. It estimates the urgent needs in the short term to progress these early steps are a minimum of US$ 0.8 billion per year, rising to a minimum of $1.2 billion per year in 2012 and $2.7 billion by 2030.
    - Sectoral estimates are starting to emerge. For example, the costs of coastal protection for sea level rise and storm surge are estimated at ….*these will follow – we are just waiting for DIVA results for Africa*. However, many gaps remain and cross-sectoral costs are often not included.
    - Information is also available from the aggregated IAMs. The PAGE model estimates that adaptation could reduce the economic costs of climate change in Africa significantly, from 2% to 1% of GDP by 2040 (that is, from $ 230 billion to $ 148 billion), and from 10% to 7% of GDP by 2100 ($ 530 billion to $ 349 billion with a business as usual scenario). These large benefits can be compared to the estimated costs of adaptation in the model-- $4.5 billion per year in Africa from 2020 onwards. These costs are very low in comparison with the economic benefits of adaptation, demonstrating the justification for early adaptation.

How does this link to low carbon growth and other finance opportunities?

- There are existing international financing mechanisms for encouraging low carbon development paths in developing regions such as Africa, which potentially involve extremely large-scale flows for investment: as an example, low-carbon investments in developing countries could be at least $20-30 billion per year. However, accessing these funds to date has been challenging in Africa, and the current project-based approaches place high transaction costs on small countries. Nevertheless, following a low carbon development pathway could provide significant economic opportunities for Africa, and is strongly in its own self-interest.
- These low carbon trajectories are particularly important to maximise the planned development across Africa, to ensure future growth avoids getting 'locked' in to high emissions, and to allow maximum potential for capturing financing opportunities now and in the future.
- There is the potential to implement no regret (win-win) measures across many areas of economic activity, which are available at low or no cost now, and can improve economic efficiency, and deliver low carbon and development objectives.
- In many cases low carbon energy investments have similar or even lower marginal costs than fossil alternatives, which are further enhanced by the potential for carbon credits and also provide important other co-benefits from reducing energy imports, enhancing energy security, improving air quality and health, reducing pressures on natural resources, and improving adaptation capability by exploiting synergies.
- There is also a very large and untapped potential for low carbon - pro-poor economic growth projects, with opportunities to achieve poverty reduction and climate change benefits through low carbon energy access programmes.
- Curbing deforestation is also part of this low carbon pathway, and is now the subject of potential new financing flows (reducing emissions from deforestation and forest Degradation in developing countries (REDD)) and also provides protection of natural habitats and ecosystem services.
- There is a need to consider the linkages between adaptation and these low carbon pathways, in order to exploit the cumulative opportunities that arise from considering them together. Examples of the types of project are shown below for East Africa.



Examples of low carbon growth in East Africa

What next? How do we move forward?

- There is a large need for adaptation finance for Africa. Entitlement to substantial funds must be assured and effective mechanisms and institutions for access and effective use must be developed.
- Economics will play a key role in assessing early adaptation plans. However, our knowledge of the future climate is still highly uncertain and decision making must bear this in mind.
- Following from this, there is a need to prioritise where early action is most effective, which can be addressed with a tiered approach. This starts with building capacity and raising awareness of climate change – including in economics, finance and planning – as a necessary precursor to improving current resilience, addressing the current 'adaptation deficit' and preparing for the future.. It should also identify and implement win-win, no regrets or low cost options, justified by current climate conditions, or based on projected climate change, but involving minimal cost. Finally, it should identify areas where early planning is needed, even in the face of uncertainty. This would include for investments with long-life times or where lock-in is a risk, for cases where there is the threat of irreversible effects or potential loss of options, and for major consequences. As and when the evidence of climate change and climate change impacts unfolds, other possible adaptation options, which involve higher costs, can be considered.
- There is a need to agree on early next steps, including the effort over the next 3 to 5 years. This requires a programme to investigate the evidence, progress the information base, look into institutions for finance and risk management and look at investment costs with long life-times (infrastructure). There is also a need to link these adaptation measures with low carbon opportunities, to maximise the potential benefits.