



Economic Assessment of the Impacts of Climate Change in Uganda

National-level assessment

Climate Change and Infrastructure

Introduction

Uganda's infrastructure is currently subject to major impacts from climate variability: this is not a problem only for the future but very much something that urgently needs to be addressed today. In this study an estimate is made of:

- 1) the costs of making the country's infrastructure more resilient in the face of increased climate stress such as increased rainfall and changes in temperature; and
- 2) the cost of damage to infrastructure from extreme events.

Estimated Impacts

Climate Resilient Infrastructure

Infrastructure comprises residential buildings, non-residential private buildings, public infrastructure (including schools, hospitals, ports, airports, government offices) and roads, railways and bridges. The key findings for the cost of improving the resilience of infrastructure to climate change are the following:

1. **Total costs for ensuring climate resilient infrastructure in Uganda are estimated at US\$60-76 million for the year 2025; and US\$347-621 million for the year 2050.** New construction accounts for around 76-80% per cent of total costs; the rest is additional maintenance.
2. With the more climate friendly scenario (RCP4.5), **total costs for the whole period 2010-2050 are around US\$2.9 billion** while with a less friendly scenario (RCP 8.5), total costs to 2050 can be as high as **US\$4.4 billion**.
3. **The most affected sector is residential buildings, which account for around half of all costs.** Public buildings account for approximately 25% of all costs, and other private non-residential infrastructure account for 17%. In fact, if we take the infrastructure sector as a whole, it is buildings that account for most of the costs (96%). The low cost for transport is mainly the result of projected decline in precipitation: with an increase in precipitation transport costs would play a bigger part as that sector is more affected by an increase in rainfall.

The Government's Costed Implementation Strategyⁱ, estimates a total cost for transport and works of US\$1.05 billion over the next 15 years (i.e. to 2030). This compares with the estimate from this study of US\$735-930 million. The difference between



the two estimates partly lies in the different approaches and partly in the items covered. This report has done a more detailed assessment of climate resilience needs but it has not evaluated the costs of site investigations for future infrastructure development or the costs of water catchment protection. These two items would add US\$394 million to this study's estimates, giving a total figure of about US\$1.1 to US\$1.3 billion, which is slightly higher than the Government's estimate.

Extreme Events

The report estimates the cost of extreme events on infrastructure based on the frequency of such events in the past and the damages they caused. Damages included in the study are loss of life and injury, damage to property, costs to persons due to dislocation and inconvenience and disaster relief. The key findings are as follows:

- If there is no increase in frequency or intensity of extreme events to 2050 then the damages, which are currently between US\$20-130 million a year (depending on how you value the loss of life), rise to US\$34-214 million by 2025 and to US\$234-809 million by 2050.
- **A doubling of frequency of extreme events every 25 years under climate change would result in damages of around US\$68-429 million by 2025 and US\$938-3,236 million by 2050.** This is equivalent to 0.1-0.4 per cent of GDP in 2050.
- The figures are average of expected damages; an extreme event similar to the El Nino floods in 2007 would represent very significant costs in 2025 and 2050.

Adaptation Priorities

The study concludes that the key adaptation priorities for infrastructure include:

- climate proofing public buildings;
- developing standards for transport and infrastructure planning; and
- integrating climate resilient standards into

existing infrastructure risk assessment guidelines.

All of these actions must precede any new investment in infrastructure. Table 1 lists the items in the Government's Costed Implementation Strategy with a qualitative assessment of their priority.

As far as extreme events are concerned the Government's Costed Implementation Strategy proposes, in addition to the above, a number of actions under risk management that are relevant to protecting infrastructure from extreme events, with a total cost to 2030 of US\$12 million. If we compare the cost of the government's projected adaptation program for disaster risk reduction, it is only a fraction of the cost of damages estimated from extreme events. If the government program can reduce damages by even a small amount (i.e. around 7 per cent) they will, under the most conservative assumptions, generate a rate of return of at least 10 per cent.

Table 1. Adaptation Measures for Infrastructure

| Item | Amount to 2030 | Agency Responsible |
|---|----------------|---|
| Very high priority | | |
| US\$Mn. | | |
| Integrate climate change into the existing infrastructure risk assessment guidelines and methodology | 14 | Ministry of Water & Env't (MWE) |
| Establish and enforce climate change-resilient standards for transport and infrastructure planning and development through monitoring and reporting systems | 22 | Ministries of Works & Transport (MWT) and MWE |
| Climate proof public buildings | 66-91 | MWT * |
| High priority | | |
| Private non-residential buildings | 33-46 | Private sector* |
| Residential buildings | 148-203 | Private sector* |
| Paved roads | 19-20 | MWT * |
| Railroads | 30-39 | MWT * |
| Climate-proof existing and future infrastructure by conducting geotechnical site investigations to determine whether areas are appropriate or inappropriate for infrastructural development | 204 | MWT & MWE |
| Medium priority | | |
| Promote and encourage water catchment protection in transport infrastructure development and maintenance | 192 | MWT & MWE |

(*) Most of the expenditures will be phased as and when the relevant investments in infrastructure are undertaken.

ⁱ Ministry of Water and Environment, *Uganda National Climate Change Policy costed Implementation Strategy*, 2012.

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