

Climate Adaptation: Risk Management and Resilience Optimisation for Vulnerable Road Access in Africa

AfCAP Project GEN2014C

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Introduction to the Programme

The African Development Bank (AFDB) states that Africa is one of the most vulnerable regions in the world to the impacts of climate change (AFDB 2011). The majority of both bottom up and top down studies suggest that damages from climate change, relative to population and Gross Domestic Product (GDP), will be higher in Africa than in any other region in the world. In the past four decades (1975 to 2015), African countries have experienced more than 1,400 recorded weather related disasters (meteorological, hydrological and climatological). These disasters have had significant impacts on countries' economies and in particular on rural communities and their livelihoods.

In order to help address a significant climate impact to Africa's development, a consortium led by CSIR (South Africa's Council for Scientific and Industrial Research), has been commissioned by AfCAP to produce regional guidance on the development of climate-resilient rural access in Africa through research and knowledge sharing within and between participating countries. The output will assist the development of a resilient, future-climate-proof road network that reaches fully into and between rural communities.

Briefing Document No1 sets out the scope and objectives of Phase I of the programme, current climate projections and defined Work Package outputs.

Briefing Document No2 covers observed impacts of weather-related disasters: climatic factors affecting roads; quantification and prioritisation of risks and contextualizing climate threats on rural road access (Mozambique case study).

Briefing Document No3 sets out the Draft Adaptation Options report which provides a methodology for developing an adaptation strategy and addresses engineering and non-engineering adaptation options. The crucial importance of effective drainage is highlighted and also the critical need for timely and appropriate maintenance.

Progress to date

The *Climate Threats Report* (July 2016) addresses how the threats can be assessed, characterised and prioritised. It presents a review of the current and future climate threats and their likely impacts to rural road networks.

The *Climate Adaptation Options Report* (September 2016) provides a methodology for developing an adaptation strategy and addresses engineering and non-engineering adaptation options. The crucial

importance of effective drainage is highlighted and also the critical need for timely and appropriate maintenance

A further aim of Phase I is to provide the basis for the implementation of demonstration sections in three countries, namely Ethiopia, Ghana and Mozambique, and to deliberate the guideline documents as well as the recommendations for the implementation of demonstration sections at workshops that will be held in these three countries. The outputs of these workshops will define the objectives and scope for Phase II of the study.

Phase II Recommendations for discussion

Draft Recommendations for Phase II Report (December 2016) contains preliminary recommendations for the climate adaptation of three roads, one in each of the above countries. These roads, which will form the basis of the demonstration programme, are representative of the range of potential hazards that low volume access roads are likely to be exposed to in AfCAP Partner Countries. The roads were selected following site visits undertaken in these three countries. The report also contains field notes on other roads inspected during these visits.

The report also presents preliminary recommendations for Phase II of the study, focussing on:

- a) Demonstrating appropriate engineering and non-engineering adaptation procedures, and the assessment of the socio-economic impacts of adopting more climate resilient adaptations;
- b) Sustainable enhancement in the capacity of three AfCAP partner countries;
- c) Sustainable enhancement in the capacity of additional AfCAP partner countries; and
- d) Uptake and embedment across AfCAP partner countries.

The preliminary recommendations made in this report will be discussed at workshops that will be held in Mozambique, Ghana and Ethiopia in late January and early February 2017.

Following site visits undertaken to Mozambique, Ghana and Ethiopia, roads (one in each country) have been identified for the installation of climate resilience adaptation measures. Summary field visit reports are included in the Report.

The three roads identified as candidates for the demonstration programme are:

MOZAMBIQUE: Road R448 from Chokwe to Macarretane, located in the Gaza Province. The dominant problems identified were:

1. Loss of surfacing on low lying roads during overtopping
2. Pavement failures due to raised moisture contents in sub-layers
3. Erosion of high embankments and loss of surfacing during flooding
4. Undermining of embankment due to flooding



Erosion of embankment and undercutting of pavement caused by overtopping

GHANA: *The Tampion-Tibognaayili-Tidjo Road*, located north of Tamale. The dominant problems identified were:

1. Erosion of side drains and road surface
2. Impassability due to poor materials and local ponding of water
3. Poor road condition due to unsuitable wearing course gravel
4. Flooding of the road where no drainage or insufficient structures exist
5. Erosion around existing drainage structures



Eroded, poorly drained section of road with laterite outcrops

ETHIOPIA: *The Tullo Bollo to Kela Road*, located south of Addis Ababa. The dominant problems identified were:

1. Shear failure due to excessive subgrade moisture
2. Erosion of wearing course and side-drains on grades
3. Slope instability
4. Erosion of embankments near structures
5. Collapse of structures



Landslide scar on hill with erosion of embankment in foreground

Preliminary recommendations for the adaptation of these roads are provided with an overview of the country and a description of the project site, as well as proposed remedial actions to render sections of these roads more climate resilient.

As all three roads are currently on upgrading/improvement programmes, it is recommended that most the length of the roads be constructed in accordance with the currently proposed designs. However, certain selected sections that have suffered similar problems to adjacent sections should be constructed differently to improve their climate resilience, in line with the recommendations given in the Report. This will allow a direct comparison of the effectiveness of each adaptation measure with the standard practice to determine whether it is practical, successful and cost-effective. It is essential that the additional costs associated with the adaptation measures, compared with the normally designed costs, are carefully monitored and quantified as well as any additional or reduced maintenance costs on all sections. This will allow a comparison of the total costs of installing and maintaining climate resilience with conventional design, which can be used to calculate total life-cycle costs after exposure to severe climatic conditions.

The Report indicates the types of adaptation measures that should be installed but do not go into the detailed design or specification of these measures at this stage. This will be carried out as part of Phase II of the project.

Proposed objectives and scope for Phase II of the study

Preliminary recommendations on the objectives and scope for Phase II of the project *Climate Adaptation: Risk Management and Resilience Optimisation for Vulnerable Road Access in Africa* are provided in the Recommendations Report.

The recommendations for Phase II cover the following main activities to be conducted over a period of 70 weeks:

- **PART 1: demonstrate appropriate engineering and non-engineering adaptation procedures**
Identify, characterise and demonstrate appropriate costed engineering and non-engineering adaptation procedures that may be implemented to strengthen the long-term resilience of rural access. Assess the socio-economic impacts of adopting more climate resilient adaptations.
- **PART 2: sustainable enhancement in the capacity of three AfCAP partner countries**
Engage meaningfully, from project inception onwards, with relevant partner-country Road and Transport Ministries, Departments and Agencies/Authorities in a knowledge dissemination and capacity building programme based on the outputs from the research. Capacity building should include a wide range of targets from central government agencies to village groups.
- **PART 3: sustainable enhancement in the capacity of additional AfCAP partner countries**
Carry out situational analysis and initiate capacity building programme in additional countries.
- **PART 4: uptake and embedment across AfCAP partner countries**
From informing national policies, through regional and district planning, down to practical provision of guidance on adaptation delivery at rural road level.
- **PART 5: Phase III recommendations**
Set out proposals for long term monitoring and evaluation.

The following is a five-step process proposed for systematic capacity building. It will focus on the three pilot countries initially:

1. Engage stakeholders on capacity development

An effective capacity building process must encourage participation by all those involved. Engaging stakeholders who are directly affected allows for more effective decision-making, it also makes development work more transparent.

2. Assess capacity needs and assets

Assessing pre-existing capacities through engagement with stakeholders informs what areas require additional training, what areas should be prioritised, and in what ways capacity building can be incorporated into local and institutional development strategies.

3. Formulate a capacity development response

The capacity building response could be based on:

- *Institutional arrangements* – policies, procedures, resource management, organisation, leadership, frameworks, and communication;
- *Leadership* – high level involvement will help priority setting, communication and strategic planning;

- *Knowledge* – knowledge is the foundation of capacity;
- *Accountability* – the implementation of accountability measures facilitates better performance and efficiency.

4. Implement a capacity development response

Implementing a capacity building program should involve the inclusion of multiple systems: national, local and institutional. It should involve continual reassessment and expect change depending on changing situations. It should include evaluative indicators to measure the effective of initiated programs.

5. Evaluate capacity development

Evaluation of capacity building promotes accountability and feeds into a programme of continuous improvement.

Interest and Participation

We have established a contact database of those interested in this programme. There are several levels of involvement anticipated from contact through to Knowledge Exchange Network:

- General interest
- Officer in relevant Ministry, Department or Authority/Agency
- Researcher
- National Expert

We have established a link for Climate Adaptation through the Regional Projects tab on the ReCAP website. This will enable you to register your contact details and to participate in the knowledge exchange programme.

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