

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

AfCAP Project GEN2014C

Briefing Document No3 (October 2016, prepared by the Council of Scientific and Industrial Research (CSIR), Paige-Green Consulting (Pty) Ltd and St Helens Consulting Ltd Consortium)

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. 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. The high social vulnerability and low adaptive capacity of these communities as well as their high exposure to natural hazards has resulted in the death of more than 600,000 people (95 per cent due to droughts), left 7.8 million people homeless (99 per cent due to flooding and storms) and affected an estimated 460 million people.

The Africa Community Access Partnership (AfCAP) is a programme of applied research and knowledge dissemination funded by the UK Government through the Department for International Development (DFID). 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 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 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).

Progress to date

Climate change constitutes a major threat to the Africa's development and has major implications and impacts on National economies. Much damage already exists with a growing backlog of maintenance and rehabilitation of roads and structures increasingly undermining rural access.

A *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.

A *Draft 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 importance of timely and appropriate maintenance.

Work is also ongoing, in parallel, to help the governments of Ethiopia, Mozambique and Ghana to establish demonstration sites to test the outputs of the programme for Climate Adaptation including:

- a) Securing buy-in into the project from key Stakeholders;
- b) Identification of areas of interest for the demonstration projects;
- c) Setting dates for the field studies;
- d) Identification of counterpart engineers/researchers;
- e) Understanding their challenges in coping with weather/climate effects; and
- f) Obtaining their full GIS database on their road network.



Complete loss of embankment and road due to turbulent flow conditions during overtopping and weak subbase (Courtesy Paige-Green Consulting Ltd)

The following sections of this Briefing Document are extracts from relevant chapters of the Adaptation Report.

Purpose and scope

The purpose of this report is to:

- Conceptualise climate vulnerability and adaptation strategies
- Set out a methodology for mitigation and adaptation
- Provide options to create resilience
- Provide guidance for building adaptation strategies into roads Policy, Planning and Standards.

After describing climate change effects on infrastructure and rural access, an overview of a recommended adaptation strategy is set out. Adaptation strategies are put in place to:

- Decrease the vulnerability of transport infrastructure to changing climate conditions
- Increase the resilience of infrastructure
- Plan to place new infrastructure in areas which are projected to have a lower risk of potentially harmful environmental changes
- Identify new construction materials, new construction methods, flexible design standards, and different approaches to design to ensure infrastructure can withstand the projected changes in climate).

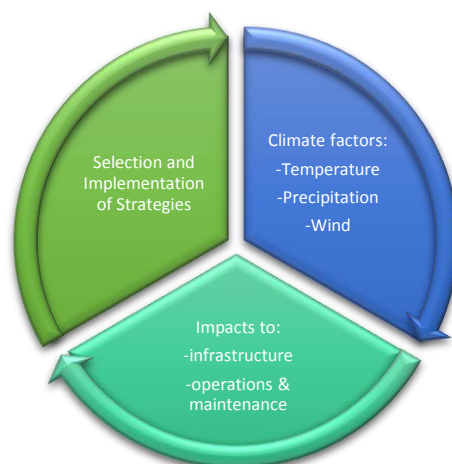
Strategies and methodology

Adaptation strategies aim to reduce the **impacts** of specific types of climate effects. These include:

- Protecting existing assets or relocating assets away from vulnerable areas to preserve functionality
- Retrofitting vulnerable facilities
- Improving overall catchment/storm-water drainage
- Constructing new facilities
- Do little or nothing and divert funds/efforts to facilities with greater priority.

Alternatively, a strategy aims to reduce or mitigate the **consequences** of the impacts to infrastructure for impacts that have already occurred. These include:

- Preserving human life
- Reinstatement of former accessibility
- Minimising economic impact
- Replacing damaged infrastructure as quickly as possible
- Changing maintenance regime.



Climate drivers that impact highway infrastructure and operations, resulting in need for adaptation strategies

The methodological approach for assessing adaptation to climate change uses a modified approach of the *ADB Guidelines for Climate Proofing Investment in the Transport Sector Road Infrastructure Projects* (ADB, 2011) and is divided into six different sets of activities, see figure below. The process begins with a rapid screening as to whether a project may be at risk from climate change, and ends with defining implementation arrangements and monitoring frameworks. The core activities fall under the categories of impact assessment, vulnerability assessment, or adaptation assessment through to implementation and monitoring/evaluation. The activities are then broken down into 20 steps and fully described.



Adaptation activity stages

Adaptation techniques for handling the expected changes in temperature and precipitation, windiness, sea-level rise and more frequent extreme events are identified and discussed. These are specifically related to unpaved roads, paved roads, subgrade materials, earthworks and drainage within and outside the road reserve as well as possible implications for construction activities. The importance of timely and good maintenance practices is also highlighted and guidance given.

Interest and Participation

We have established a database of those interested in this programme. There are several levels of involvement anticipated from contact database 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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