Technical Brief

ReCAP Research for Community Access Partnership

UKaid from the British people

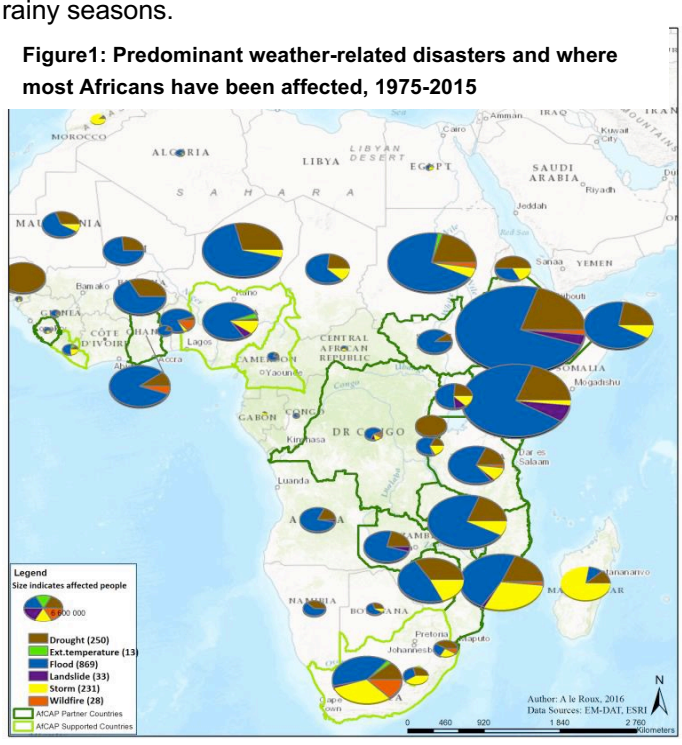
Designing Climate-Resilient Roads for Long-Term Rural Access

Problem addressed

With over 1,400 weather-related disasters affecting 460 million people in the past 40 years, Africa is among the most vulnerable regions in the world to the impacts of climate change. Infrastructure damage relative to population and GDP are highest in Africa. Yet, capability to adapt and mitigate the effects of increasingly frequent climate events is limited, with rural populations at greatest risk.

Millions of rural communities in Sub-Saharan Africa (SSA) rely on low-volume roads (LVRs) which comprise the bulk of road networks across Africa[1]. They are lightly trafficked, and typically poorly built, in part because they are designed based on *historical* rather than future climate conditions. This makes them especially vulnerable to degradation from extreme climatic conditions. Many are already impassable in the rainy seasons.

Figure1: Predominant weather-related disasters and where most Africans have been affected, 1975-2015



Experts estimate it will cost $20-30 billion annually for the next 20 years, to adapt Africa's roads networks to predicted temperature and precipitation changes. Climate-resilient LVRs and transport infrastructure are vital to improving the resilience of highly vulnerable communities.

Overall aim

Secure the welfare and adaptive capacity of vulnerable rural communities by enabling SSA countries to mitigate current and future climate impacts on LVRs, thereby ensuring climate-resilient access to markets and services.

Objectives

- Strengthen the evidence base and for incorporating climate change adaptation into LVR planning, budgeting, design, construction and maintenance.
- Identify the current and future vulnerability of rural road networks, assess the climate risks to rural communities, demonstrate cost-effective, climate-resilient, engineering as well as non-engineering solutions and promote embedment of procedures that improve all-season LVR access through appropriate design, maintenance and construction techniques.

Approach

Ghana, Ethiopia and Mozambique were selected as lead countries based on the criteria in Figure 2.

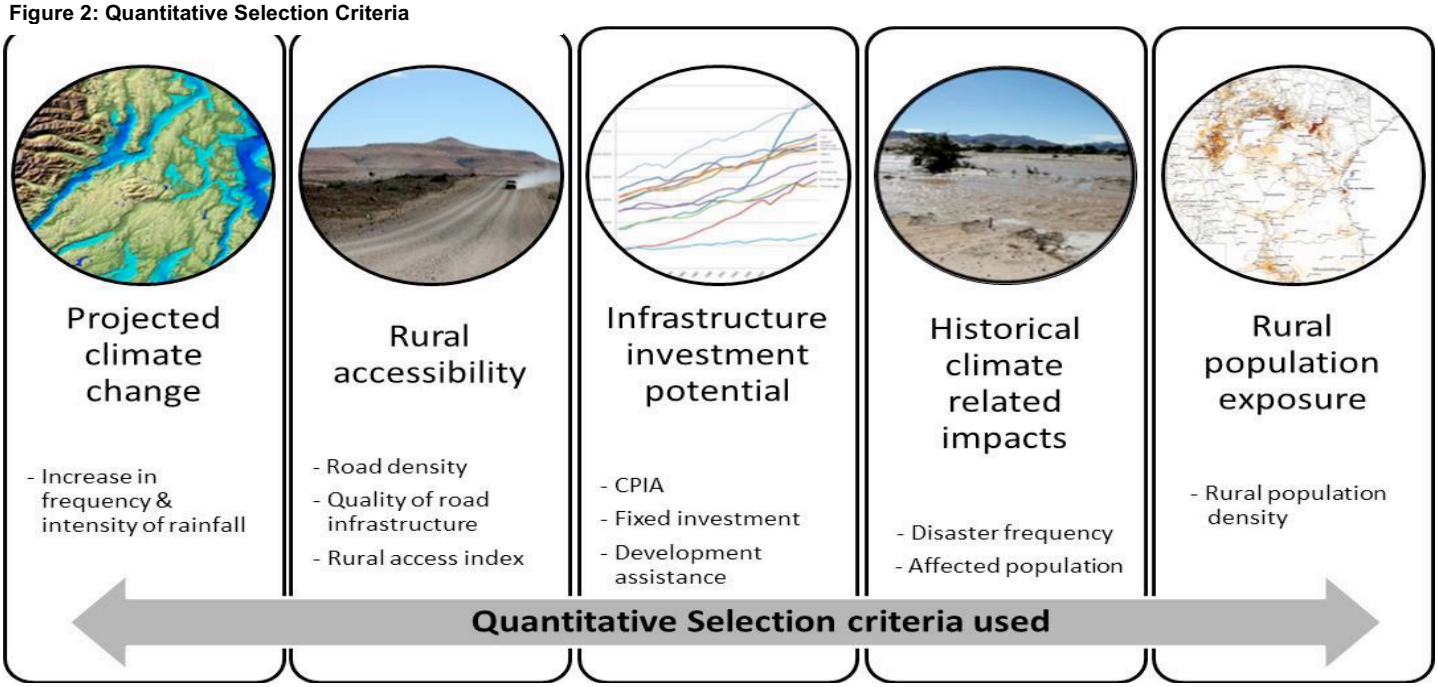
Phase 1: Scoping and development of a methodology for assessing vulnerability; adaptation options developed; and three lead countries selected for demonstration in phase 2, including identification of suitable sites for the demonstration section.

Phase 2: Development of a Climate Adaptation handbook and supporting guidelines for use in lead countries; methodology contained in the handbook and guidelines tested at demonstration sites in the three lead countries; country reports drafted for lead countries.

Phase 3: Update the handbook and guidelines; measure and evaluate the success of the adaptation measures; and expand to other SSA countries.

[1] >40% of rural Africans live within 2km of an all-weather road, making disaster assistance, social, medical, educational and other interventions timely, costly and unreliable.

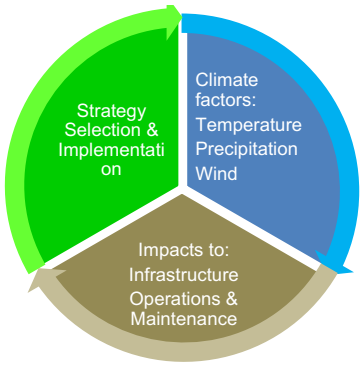
Figure 2: Quantitative Selection Criteria



Challenges

- Existing LVRs are mainly based on historical climate conditions, not foreseeable future models.
- Environmental Impact Assessments (EIAs) are required to evaluate any new road's impact on the environment. However, the impact of the environment on new roads is not normally considered in a systematic way.
- Greater frequency of extreme weather events along with expected changes in rainfall and temperatures will exacerbate deterioration of existing LVRs thus increasing impassability and reducing access for rural communities.
- Limited knowledge and funding are challenging countries to identify climate change threats, assess vulnerabilities, develop adaptation approaches, incorporate changes into mid-range and long-term development plans and justify requests for funding to make the necessary adaptations.

Figure 3: Climate Adaptation and Resilience Process



Outcomes

- SSA practitioners have embedded systematic procedures, tools and training that enable them to decrease the vulnerability of LVR networks to changing climate conditions by:
  - Identifying existing/future LVRs, other road assets and activities that climate change will affect;
  - Anticipating, preparing for, responding to and recovering from climate hazards with minimum damage to social well-being, the economy and the environment;
  - Evaluating & prioritising relevant risks and opportunities;
  - Selecting and implementing the best options to address the risks/opportunities; and
  - Planning placement of new LVR infrastructure in areas projected to have a lower risk of potentially harmful environmental changes.
- Climate Adaptation Handbook: Managing risks and optimising resilience of vulnerable LVRs; covers new construction, rehabilitation/retrofitting, maintenance.
- Vulnerability and Threat Guidelines: Provides a semi-quantitative risk and vulnerability assessment framework
- Engineering Adaptation Guidelines: All measures to adapt different LVR networks and components to expected local climate changes.
- Non-engineering Adaptation Guidelines: Highlight options for: policy, strategy and programme feedback; asset management systems; maintenance planning, early warning and emergencies; augmenting design standards; research priorities; road alignments; user safety provisions; capacity building; how to maximise uptake, embedment of climate adaptation strategies.