



Outcomes and Impacts Report

AFCAP Core Management Group

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This report was funded by the Africa Community Access Programme (AFCAP) which promotes safe and sustainable access to markets, healthcare, education, employment and social and political networks for rural communities in Africa.

Launched in June 2008 and managed by Crown Agents, the five year-long, UK government (DFID) funded project, supports research and knowledge sharing between participating countries to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources.

The programme is currently active in Ethiopia, Kenya, Ghana, Malawi, Mozambique, Tanzania, Zambia, South Africa, Democratic Republic of Congo and South Sudan and is developing relationships with a number of other countries and regional organisations across Africa.

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Africa Community Access Programme

Outcomes and Impacts Report

1 Summary

The Africa Community Access Programme (AFCAP) is a DFID-funded research programme for the rural transport sector in Africa. It includes research on design standards and maintenance of low traffic rural roads and research on promoting transport services in rural areas. AFCAP started in June 2008 and is scheduled to end in March 2014.

The DFID budget for AFCAP is £13 million, but significant contributions have been made by participating governments and other development partners. This includes about £12 million contributed by Africa governments and their development partners for the construction of road research sections, financing of road maintenance trials, training, and in-kind support to the AFCAP research projects.

AFCAP was designed to include a range of activities that would increase knowledge and share it amongst practitioners in the sector. The expected impact of AFCAP was “sustained economic development, poverty reduction and improved livelihoods of the rural poor through more effective, efficient and equitable **access** to socio-economic opportunities”. However, it was not clear from the outset how AFCAP could genuinely contribute to this impact. AFCAP was in danger of experiencing the shortcomings of similar initiatives in the past, which struggled to institutionalise new knowledge and ensure its uptake in participating countries.

At an early stage in the implementation of AFCAP it was realised that it would be possible to contribute effectively to the planned impact through a slightly different approach. The first objective would be to produce technical documentation (e.g. road design manuals and technical specifications) that reflected best practice, were endorsed at the highest level by partner governments, and could be enforced on road investment and maintenance projects. The second objective was to build capacity in the participating countries to manage their own programme of research, enabling these countries to manage and expand their knowledge base, and independently implement future improvements to the documentation.

Official, government approved, manuals for the design of low volume roads¹ have now been published through AFCAP in Ethiopia and Malawi, and are expected to be published in Kenya and South Sudan by the end of the current phase. These documents are being used on road investment projects in the respective countries, including the construction of 60,000km of all weather rural roads in Ethiopia. A Maintenance Manual for Tanzania produced under AFCAP will guide the implementation of maintenance on 58,000km of district roads once it is approved and adopted by the government. In Kenya the adoption of appropriate design standards for Low Volume Sealed Roads (LVSR) has the potential to save up to £490 million in the construction of 1,228km of paved rural roads under the Kenya Rural Roads Authority’s (KeRRA) 2013-2018 Strategic Investment Plan. In Malawi the adoption of the LVSR approach could lead to savings in excess of £10 million in the construction of 60km of LVSR under the Agriculture Sector Wide Approach (ASWAp)².

More recently, AFCAP has begun conducting research to increase understanding of the transport needs of communities and road users. This includes men and women requiring access to health care, markets and education, encompassing youth, the aged and small farmers. These are groups that may not automatically benefit from road infrastructure improvements. Examples of AFCAP Transport Services activities include road safety research in Tanzania, which will recommend measures to reduce accident rates on rural roads (including safer motorcycle taxi operations), and a regional research project which is developing Transport

¹ Low volume roads are defined as roads carrying less than about 300 four-wheeled motorised vehicles per day, or one million equivalent standard axles over the design life.

² For details of Kenya and Malawi examples see Section 3.3.

Service Indicators designed to complement the World Bank's Rural Access Indicator (RAI)³. The new indicators will enable more accurate measurement of access by rural communities to transport services.

Building local research capacity in African countries is a long term objective. Prior to AFCAP very little research was being conducted in most of the participating countries. Regional research projects funded by DFID and other donors in the 1980s and 1990s produced important outputs, but they relied heavily on foreign expertise. There was limited transfer of capacity to local partners. AFCAP has created an awareness of the value of research in the participating countries through its close collaboration with key agencies in the sector, and has provided some of the tools needed by governments to establish their own research programmes. Limited funding for research is available from government budgets and from road user charges collected by road funds; but it will be a long time before most African research institutions in the road transport sector will be able to recruit and retain staff with the required range of expertise. This is probably the greatest challenge for AFCAP in the years to come.

³ The RAI is a standard measure of the quality of access in rural areas. It measures the number of people living within two kilometres of an all-weather road, but takes no account of whether there are transport services on the road.

2 Description of the programme and outputs

AFCAP comprises a portfolio of research, demonstration, advisory and training projects. The project outputs are contributing to improvements to road access for rural communities in Africa. AFCAP is building on a considerable body of research established over several decades in Africa on the construction and maintenance of rural roads. AFCAP is also building on the achievements of the South East Asia Community Access Programme (SEACAP), which was a DFID-funded rural transport research programme in Laos, Cambodia, Vietnam and Sri Lanka (2004–2009).

AFCAP is managed by Crown Agents on behalf of DFID. The Programme Manager, Procurement Manager, Communications Manager and administration staff are based in the UK. Crown Agents employs two engineering Technical Managers for AFCAP who are based in Africa, and a Transport Services Adviser based in the UK. Oversight is provided by a Steering Group comprising AFCAP Coordinators from the participating countries, DFID, other donors, and senior rural transport practitioners.

The core participating countries in AFCAP are Ethiopia, Kenya, Malawi, Mozambique, Tanzania, South Sudan and DR Congo. Formal agreements have been concluded with the governments of these seven countries, including the identification of a host agency and an AFCAP Coordinator. Research projects are also being implemented in South Africa, Zambia and Nigeria, as well as a regional project with the Southern Africa Development Community (SADC).

The main beneficiaries of AFCAP are rural communities in Africa. These communities will benefit from safer and more reliable road transport. They will have easier access to social services and employment opportunities. Savings generated through more efficient and cost effective road pavement and surfacing designs will enable governments to construct and maintain increased lengths of road. More efficient transport services are expected to result in lower transport costs for rural communities. The AFCAP focus on paving low traffic rural roads will lead to more comfortable and safer travel, reduced dust, reduced extraction of ever-dwindling natural materials for surfacing gravel roads, and greater resilience to the effects of climate change.

AFCAP's achievements were recognised at the 2013 British Expertise International Awards, announced in March 2013, where AFCAP won the "Outstanding International Collaboration" award. The British Expertise International Awards recognise and celebrate international achievements by companies in the UK professional services sector.

AFCAP research projects typically include:

- Applied research on new or improved methods for road network management. For example alternative forms of contract for road maintenance management, the GPS method for monitoring the condition of low volume roads and a new global indicator for measuring the effectiveness of transport services.
- Research studies to increase understanding of the needs of road transport users, for example public transport users, men and women requiring medical attention (including maternal health and obstetric emergencies), and the aged; investigations into appropriate interventions to reduce accident rates on district roads, including safer motorcycle taxi operations.
- Construction of research and demonstration roads sections that utilise alternative pavement design standards and surfacings. On each research section a baseline of technical monitoring data is collected. Follow up visits are made (typically every 6 months) for the collection of new data on the road condition for comparison with the baseline. Training has been provided for local partners in the design process, the construction activities, and the technical monitoring. Construction costs of the road sections are met by partner governments.

Parliamentary Under Secretary of State, Lynne Featherstone MP, said: "DFID is delighted to have supported such a positive collaboration between British and African engineers, and even more delighted that this collaboration will enable millions of people across Africa to have reliable all-year access to the healthcare, education and markets that they need."

- Back analysis of the performance of low volume sealed roads that were constructed in the past to unconventional design standards; recommendations for revisions to national standards based on this historical information.
- Preparation of new peer reviewed design manuals and specifications that promote international best practice and are officially endorsed by partner governments.
- Conferences, workshops, and study visits to facilitate knowledge sharing and dissemination.
- Formal training events for practitioners in the public and private sectors, as well as for community groups (e.g. on road safety).
- Preparation of peer reviewed journal papers.
- Support to the development of national research centres for the rural transport sector, including analysis of options for sustainable local funding, establishment of facilities, and the development of local expertise to undertake research.

The contribution of these projects to the indicator targets is summarised in the programme Quarterly Reports. These reports are available from DFID⁴ and the AFCAP web site⁵. A DFID Annual Review conducted between March and April 2012 concluded that “against the outputs as currently defined the project is over-achieving”. The review team noted that they had “seen strong evidence of good research, new technologies, uptake and implementation that is already leading to development outcomes”. AFCAP achieved DFID’s highest Annual Review score of A++.

The 2012 Annual Review team did identify some output challenges for AFCAP, including:

- Developing capacity of local research centres and dissemination of the technical and socio-economic work to a wider audience.
- Increased focus on gender aspects of the programme.
- Capacity building within road authorities for improved quality assurance of their work, to increase their understanding of technical specifications and cost implications of these, as well as the wider socio-economic impacts of road building.
- Increased collaboration with other donors to further expand the approaches.
- Improved management of the construction of research and demonstration sites.
- Creating baseline and Monitoring and Evaluation systems within the national roads authorities to enable effective evaluation and ensure long term monitoring of research projects.

“AFCAP is a very impressive programme that is exceeding expectations. Strong delivery of all the outputs is leading to uptake of robust evidence significantly beyond the countries of focus. We believe this is also leading to positive development outcomes, though these are not being measured by the current log frame”.

DFID Annual Review Final Report. May 2012

⁴ <http://r4d.dfid.gov.uk/>

⁵ <https://www.afcap.org>

3 Planned/Intended Outcomes and Impacts

3.1 Logframe Indicators

The intended Outcome and Impact of AFCAP were modified three years after the start of the programme implementation. The changes are shown in Table 1 and summarised as follows:

- The original Impact (Goal) statement was regarded by AFCAP management as being too difficult to attribute to the programme; therefore the original Outcome (Purpose) statement was promoted to Impact level, and reworded to be (ostensibly) more easily measured.
- A new Impact indicator was introduced to monitor the maintenance of rural roads.
- One of the “Outputs” in the original Logframe (“Recommended standards applied and adopted”) was promoted to Outcome level in the revised Logframe
- Two new Outcomes (“Community of Practice” and “Concrete Examples of Change”) were introduced.

It is noted that the introduction of the “maintenance” indicator at Impact level in mid-2011 came too late for a significant modification to project priorities in order to focus more on road maintenance. AFCAP has included only one project that focused specifically on maintenance: Improved Maintenance Systems for District Roads in Tanzania (AFCAP/TAN/019).

Table 1: Changes to Outcome and Impact Statements

| | At start of project ⁶ | Following review of Logframe ⁷ |
|----------------------|--|--|
| Impact ⁸ | Sustained economic development, poverty reduction and improved livelihoods of the rural poor through more effective, efficient and equitable access to socio-economic opportunities (employment, healthcare, education, etc.). | <ol style="list-style-type: none"> 1. The percentage of the population in sub-Saharan Africa (tracked in five focus countries; Ethiopia, Kenya, Malawi, Mozambique, Tanzania) who live within two kilometres of an all-season road as a proportion of the total rural population (RAI) Rural Access Index 2. Total % of rural low volume roads sustainably maintained, in focus countries. |
| Outcome ⁹ | To create sustainable access for rural communities to external opportunities and services (including health, education, employment, markets and social and political networks). | <ol style="list-style-type: none"> 1. Recommended standards applied and adopted (for rural roads and rural transport). 2. A Community of Practice (for the rural transport sector) in Africa established. 3. Concrete examples of change (applied or formally adopted), influenced by AFCAP research, that will be applied to 200,000km of road (before 2020) in focus countries. |

3.2 Outcome Indicators

3.2.1 Recommended standards applied and adopted

At an early stage in the implementation of AFCAP it became apparent that standards for the road engineering sector could only be considered as “adopted” if they appeared in manuals or standard

⁶ Africa Community Access Programme (AFCAP). *Draft Project Document*. Undated, but believed to have been prepared in 2006.

⁷ The revised Logframe was first published in Crown Agents Quarterly Report No. 10 (April-June 2011).

⁸ Expressed as “Goal” in Project Document.

⁹ Expressed as “Purpose” in Project Document.

specifications endorsed by the government. These are documents that can be specified by a road agency in the Terms of Reference for a road pavement designer, or included in a works contract. Guidelines that do not have the endorsement of the government are seldom used in practice. Designers inevitably revert to standards that are published, irrespective of whether they are entirely appropriate. Achieving official endorsement would require a strong evidence-based approach combined with extensive stakeholder consultation and expert peer review of all outputs. It was clear that this process could not be rushed (for example the process to develop and publish the new low volume sealed roads pavement design manual for Malawi took more than three years).

The AFCAP Project Document envisaged the preparation of a “Guideline for Sustainable Rural Access in Africa”, as a key output. The preparation of this guideline would follow a similar process to the SADC Guideline for LVSRs, though covering a much larger geographical area. Early on in the implementation of AFCAP it was recognised that more guidelines were not required. The need was for government endorsed Codes of Practice for the design of low volume roads and standard technical specifications.

Research into the behaviour of road pavements is a long term endeavour if it relies entirely on the construction of new sections of road (“trial sections”). Some of the important conclusions may only be available after a period of 10 years. However, roads already exist in the region that were built to “un-conventional” standards, and these roads can offer important data on long term performance. Such data will not be available from newly constructed trial sections in the lifetime of AFCAP. Some of the roads were built 50 years ago. Back-analysis of the performance of “old” roads has now been conducted in Malawi, Mozambique, Botswana and South Africa leading to important conclusions that have been built into new manuals and guidelines. For example the section studied in South Africa used unstabilized sand in the road base and yet has performed exceptionally well. It was built in 1962. According to current design methods and specifications it should have failed a long time ago.

The examples below illustrate how AFCAP has contributed to the application and adoption of recommended standards.

Ethiopia: Support to URRAP

The Universal Rural Roads Access Programme (URRAP) is a five year investment programme of the Ethiopian Government for *wereda* (district) road improvements. The objective of the programme is to link *kabeles* (sub-district centres) to *wereda* centres with all-weather roads. URRAP is expected to cost US\$1 billion over a five year period (2011-2015) and result in improvements to 60,000km of *wereda* roads.

The AFCAP contribution to URRAP includes the development of a suite of design manuals for the design of low volume roads (LVR)¹⁰. The manuals were published by the Ethiopian Roads Authority in 2011, and were the first major output of this nature achieved by AFCAP. The design manuals are accompanied by standard specifications for *wereda* road works, standard bidding documents for minor works, and Terms of Reference for design and supervision consultants. These documents introduced international best practice for rural road engineering, including lessons learned on SEACAP and recent research on gravel road design from South Africa. Pavement design catalogues for low volume sealed roads, which were developed under a DFID research programme in Southern Africa in the 1990s¹¹, were published for the first time in an official government document.

¹⁰ Ethiopian Roads Authority. *Design Manual for Low Volume Roads*. Part A, B, C, D, E, F, G. Final Draft. April 2011.

¹¹ Gourley, CS and Greening, PAK. 1999. *Performance of low volume sealed roads: Results and recommendations from studies in southern Africa*. Crowthorne, UK. TRL. (PR/OSC/167/99).



Figure 1 Construction of Otta Seal Demonstration Site in Ethiopia

The manuals, specifications and bidding documents were adopted formally by the Ethiopian government in 2011 and are in use on URRAP. They form the basis for a new suite of manuals currently under preparation for **South Sudan**, and have been used as a reference point for rural roads design standards being developed for **Mozambique, Kenya** and **Tanzania**. The manuals were published as “final drafts” in Ethiopia, with the intention that they will be reviewed and updated after a period in use. The review will be an opportunity to also introduce new innovations developed under AFCAP, such as the DCP¹² design approach (described below).

Malawi: New Pavement Design Manual

Investigations have been carried out in Malawi on the use of “as dug” laterite gravel in the upper road pavement layers since the 1980s. This included the construction of a one kilometre trial section during 1984 and 1985 as part of a 51 km road contract on the M12 road in the Vipya highlands. Technical monitoring of the section concluded that the trial length of pavement had performed as effectively as the adjacent lengths with more expensive crushed stone. This confirmed similar experience in Kenya, Gambia, Brazil and Australia that with appropriate construction techniques, lateritic gravels can be used to provide the advantages of durable bituminous surfaced roads at lower cost¹³.

¹² Dynamic Cone Penetrometer.

¹³ Scott Wilson Kirkpatrick & Partners/Henry Grace & partners and Imperial College of Science and Technology, UK. *Malawi Low Volume Roads Study: An investigation into the use of Laterite instead of crushed stone or stabilised material as a base course for bituminous surfaced roads*. December 1988.

In 1997 the Transport Research Laboratory (TRL) of the UK supervised the construction of a trial section using untreated laterite gravel in the road base on the Blantyre to Mulange Road in Malawi¹⁴. The laterite was used in place of crushed stone. Recent reports from Malawi Road Authority representatives¹⁵ indicate that the trial section is still in good condition, and barely distinguishable from the rest of the road. The rest of the road was built with a crushed stone base at a considerably higher cost¹⁶.

In the early 2000s the Malawi Road Authority (RA) started paving roads through district centres in order to eliminate dust in the dry season and erosion and muddy conditions during the rains. The RA adopted a “low cost sealed road” approach, with untreated natural gravels, including laterites, in the road base. The works included re-shaping the existing gravel road, construction of a new base of natural gravel and a thin bituminous seal (Cape Seal). The approach built on the experience of the performance of laterite road bases from the 1980s and 1990s. The RA prepared the road pavement designs in-house, with instructions given direct to the contractor on site. The designs were not prepared in accordance with the Malawi Pavement Design Manual and the road base materials did not meet the requirements of the SATCC Standard Specifications (which have been adopted by Malawi for road and bridge works).

In 2009 and 2010 a Performance Review was undertaken by AFCAP of a selection of the roads built by the Malawi RA using their “low cost sealed road” design standards¹⁷. The study found that all of the roads investigated had performed well in the prevailing service environment. All of the roads remained structurally sound with no significant signs of distress. They were all lightly trafficked roads, carrying between 100 and 800 motorised vehicles per day¹⁸, with less than 0.5 million equivalent standard axles (MESA) since construction; but according to conventional pavement design standards, these roads should have already failed. The conclusion was that traditional design standards and specifications are inappropriate for use with Low Volume Sealed Roads (LVSRs). This supported conclusions previously reached in Malawi and elsewhere in the region.

Despite the good results derived from the use of the LVSR approach, more widespread use was constrained by concerns amongst some practitioners that the approach may be risky because it does not conform to traditional standards. The Malawi Roads Authority was becoming increasingly frustrated by the inability of design consultants to adopt the LVSR approach, and the continued submission of expensive design solutions. The RA estimates that roads built in accordance with the LVSR design approach cost as little as a third of the cost of roads built to conventional designs.

The reluctance of consultants to adopt “unconventional” standards is understandable. Their professional liability insurance prevents them from deviating from approved standards. The RA realised that the only way to achieve cost effective designs was to publish new standards and technical specifications that could be enforced by the government on road improvement projects. They requested support from AFCAP for this process.

A new manual for the design of LVSRs in Malawi has now been prepared. The development of the manual included considerable consultation with practitioners from the public and private sectors. Practical training in the use of the manual was carried out on a road near Lilongwe. The manual is accompanied by Standard Bidding Documents, including new technical specifications for pavement materials.

The design process adopted for the Malawi manual is based on Dynamic Cone Penetrometer (DCP) testing of the sub-grade (*insitu* ground) and laboratory testing of imported materials for the road pavement. This is a

¹⁴ Gourley, CS. and Greening, PAK. 1999.

¹⁵ Reported by Planning Director of Malawi Road Authority by email on 14 November 2011.

¹⁶ The TRL report on this research project does not include comparative costs for the laterite and crushed stone bases, but unit rates from a similar project on the Milange-Mocuba Road in adjacent Mozambique, which is currently under construction, show the cost of crushed stone to be nearly four times the cost of natural gravel in road pavement layers (i.e. £21 per cubic metre versus £6 per cubic metre).

¹⁷ Pinard, M.I. (2011). *Performance Review of Design Standards, Technical Specifications and Bidding Documents for existing Low Volume Sealed Roads in Malawi*, Final Report, AFCAP.

¹⁸ 2010 traffic counts.

significant departure from conventional practice, where materials are classified in terms of grading, plasticity and CBR¹⁹. The adoption of the DCP design approach was in response to the findings of the Malawi performance review study, which demonstrated that grading and plasticity are not always reliable indicators of performance of LVSRs. The performance review also found that DCP measurements of shear strength are equally reliable as CBR testing, and are considerably cheaper²⁰. An additional innovation that has been adopted through the new Malawi manual is the design of upper pavement layers at their expected *insitu* moisture content. This is a departure from the conventional approach, where materials are tested in their soaked condition. Testing of soaked samples gives a significantly lower assessment of strength.



Figure 2 DCP Demonstration in Tanzania

The DCP design approach was developed initially in Australia in the 1950s but developed further in South Africa from the 1980s. Several papers have been written on the approach²¹, but the Malawi AFCAP project is the first attempt to express the method in sufficiently prescriptive terms for a design manual and works specifications. The project introduced a DCP design catalogue which was developed by the CSIR²² in Pretoria and calibrated with the results of DCP measurements taken in Malawi. The catalogue has not previously

¹⁹ California Bearing Ratio.

²⁰ For example, in Mozambique a CBR test (3 moulds) costs \$58 in an ANE laboratory, whereas a single DCP test costs \$12 on the road. The cost of the CBR test does not include excavation of a test pit, obtaining the sample, reinstatement of the pit and transport of the sample to the laboratory. Test pits are not required for DCP testing except if *insitu* density and moisture content are required.

²¹ For example see: Paige-Green, P and Du Plessis, L. *The Use and Interpretation of the Dynamic Cone Penetrometer (DCP) Test*. CSIR Built Environment. Pretoria. May 2008.

²² Council for Scientific and Industrial Research.

been published in an official document of this type, but is now a standard element of the Malawi LVSR design manual.

Length of Road Affected by AFCAP

The table below summarises the approximate length of road that has been built to low volume sealed road standard during the period of AFCAP and the approximate cost saving that has been achieved by adopting an LVSR design approach.

Table 2: Length of Road Affected by AFCAP and Cost Savings

| Road | Length of road (km) | Construction cost (£) | Actual Cost/km (£) | Approx cost/km using conventional design (£) (5) | Cost saving (£ million) |
|----------------------------------|---------------------|-----------------------|--------------------|--|-------------------------|
| Mozambique research sections (1) | 14.6 | 877,264 | 60,087 | 150,216 | 2.2 |
| Mozambique: Zero-Mopeia Rd (2) | 40.0 | 4,333,333 | 108,333 | 216,667 | 8.7 |
| Ethiopia research sections (3) | 5.0 | 400,000 | 80,000 | 160,000 | 0.8 |
| Kenya research sections | 2.6 | 255,000 | 99,609 | 199,219 | 0.5 |
| Tanzania (4) | 11.9 | 727,217 | 61,111 | 122,221 | 1.5 |
| Malawi | 0.0 | | | | |
| South Sudan | 0.0 | | | | |
| DRC | 0.0 | | | | |
| Total | 74.1 | 6,592,815 | 81,828 | 170,770 | 13.7 |

(1) As reported by TRL.

(2) 40km extension to research section at cost of Mts 195 million.

(3) Includes Tulubulo (2.1km) and Kombolcha (2.9km) sites. Assumed cost based on cost of construction in other countries.

(4) Bagomoyo and Siha Roads. Only length of paved sections considered; some sections of each road were left with gravel or earth surface.

(5) The cost of the construction with conventional design is assumed to vary between 2 and 3 times the cost of the LVSR design depending on local circumstances. This is based on Malawi experience.

Tanzania: District Road Maintenance

In Tanzania AFCAP implemented a project to analyse options for organising district road maintenance. The research focussed on three districts in Dodoma region, where different forms of contract were implemented by the district authorities for maintaining their roads. The options included the use of Performance Based Specifications, Framework Contracts and Community Contracts. The implementation of the different systems was monitored in order to identify their relative strengths and weaknesses. The project continued over two annual funding cycles and, despite some significant constraints, drew some important lessons for the management of district roads²³.

²³ IT Transport Ltd. *Improved Maintenance Systems for District Roads in Tanzania*. AFCAP/TAN/019. Final Report. Draft-1. January 2013.



Figure 3 Concrete Slab Surfacing in Tanzania

The lessons learned on the project are specifically important to Tanzania, but also have relevance to other countries in the region. For example it was found that more continuous attention to the maintenance of roads than was previously possible through short duration contracts results in more timely attention to road damage, and produces higher service levels for road users. It was also found that Community Contracts, especially using Community Based Organisations, worked well for roads serving remote villages. This system has potential for replication and significant job creation across a large part of the district road network in Tanzania (58,000 kilometres). The final output of the project will be a government-endorsed manual providing detailed guidance on the implementation of each of the contracting options.

Tanzania: Road Safety Programme for the Bago to Talawanda Road

Official statistics from the Tanzanian Traffic Police show that there were a total of 3,981 deaths on Tanzanian roads in 2011²⁴. This estimate may be significantly lower than the actual number of fatalities due to the lack of a comprehensive data collection system. It compares with 1,901 fatalities on UK roads in 2011²⁵; the UK has a considerably larger vehicle population than Tanzania.

A baseline study carried out under AFCAP on three district roads in Tanzania showed that drivers and passengers of motorcycles were at greatest risk of being injured or killed on the roads. The majority of these motorcycles operate as commercial motorcycle taxis, known as *boda-bodas*.

Boda-bodas are now the predominant vehicle type on district roads in Tanzania. They are providing vastly improved mobility for local people, male and female, at relatively low cost, particularly when operated in conjunction with mobile phones. Yet the growth of the *boda-boda* industry has not been accompanied by enforcement of relevant regulations by government authorities. The majority of motorcycle drivers

²⁴ Bishop, T., Jinadasa D. and Palfreman, J. Road Traffic Injury on Rural Roads in Tanzania: A population based control study assessing Road Traffic Injury on rural roads in Tanzania and the effectiveness of road safety measures at reducing injury rates. Project Reference Number: AFCAP/GEN/060/G. *Implementation of the Road Safety Programme for the Bago to Talawanda Road*. Amend. January 2013.

²⁵ Department of Transport. *Reported Road Casualties in Great Britain. 2011 Annual Report*. Statistical Release. 27 September 2012.

interviewed during the AFCAP study had received no formal training and had no driving licence. Helmets, reflective vests or other safety clothing are seldom worn by either drivers or passengers.

The purpose of the AFCAP research project is to assess road traffic injuries on rural roads in Tanzania, and the effectiveness of road safety measures at reducing injury rates. Interventions were carried out by Amend, an international NGO, on the Bago to Talwanda Road in Bagamoyo District. This road had recently been upgraded to all-weather standard under an AFCAP research project on road pavement and surfacing design standards. The impact of the interventions will be measured against a baseline collected at the start of the project. The research is designed to support the objectives of the UN-endorsed Decade of Action for Road Safety, 2011 to 2020, and inform Tanzania's National Road Safety Strategy.

The interventions included:

- 100 *boda-boda* drivers were trained and obtained driving licences.
- Helmets and motorcycle back supports were distributed to *boda-boda* drivers.
- Reflector-enhanced school bags, reflective stickers and high-visibility reflective vests were distributed to community members and *boda-boda* drivers.
- Amend trained 56 teachers at six schools along the road, who then delivered a road safety course to 2,150 pupils.
- Ten community road safety events were held at five different locations along the road.

The project will monitor the outcome of these interventions and their uptake and sustainability. This will lead to recommendations for more effective road safety policy and practice in rural Tanzania, in particular for *boda-bodas*²⁶. Uptake of these recommendations remains a challenge for future phases of AFCAP, given the low priority afforded to promoting safe rural transport services by the government.

3.2.2 Community of Practice

The development of the Community of Practice (CoP) in the rural transport sector has been an important outcome of AFCAP. The CoP is a network of practitioners engaged in the management and development of the sector. The CoP mailing list currently includes over 750 names, though not all of these are active in the implementation of AFCAP. Previous support to this network was provided by DFID and other development partners through initiatives such as the Sub-Sahara Africa Transport Policy Programme (SSATP), ILO ASIST²⁷, and the International Focus Group on Rural Road Engineering (IFG).

AFCAP has supported the CoP through events such as the AFCAP Practitioners' Conferences²⁸, workshops and seminars, and training courses. AFCAP has strengthened the CoP by expanding the cadre of technical experts that undertakes research work in the region. Specific efforts have been made to incorporate experts from South Africa, who have considerable practical experience and expertise in rural roads engineering, much of which is highly relevant to other African countries. Specific efforts were made to involve consultants who had worked on SEACAP, to ensure that AFCAP could build on SEACAP experience, rather than repeating lessons already learnt. Women engineers and transport specialists have been encouraged to attend workshops and conferences, both as participants and presenters.

The peer review process of manuals and other documents was an effective means of harnessing a wider range of expertise at relatively low cost, as well as exposing the experts to the AFCAP CoP. There have been several opportunities to promote debate between experts on contentious but highly relevant subjects. These debates were conducted mainly through email exchanges, supplemented by more detailed discussion when the experts had an opportunity to meet²⁹.

²⁶ Bishop, T., *et al*, 2013.

²⁷ Advisory Support Information Service and Training – part of the International Labour Organization's The Employment Intensive Investment Programme (EIIP).

²⁸ Addis Ababa November 2010 and Maputo July 2012.

²⁹ A blogging facility was established on the AFCAP web site, but it was not effective in supporting technical discussions.

The AFCAP Technical Managers are in a unique position to support the CoP through the cross-country and cross-programme contacts they make on their routine visits to participating countries. Government road agencies and donor agencies tend to be weak at lesson learning, knowledge management and programme coordination. Similar programmes can run in parallel in neighbouring counties, or even in the same country, with minimal inter-programme learning. AFCAP Technical Managers have the resources to actively promote linkages between such programmes. This has been done informally through social interaction with the programme implementers, as well as more formally through exchange of data and reports.



Figure 4 Road Ponds Workshop in Mozambique

AFCAP research projects are formally linked to existing initiatives wherever possible. This was particularly necessary in the case of trial section construction, because construction costs were not allowed for in the DFID AFCAP budget. The cost of construction had to be included in the annual road investment or maintenance programme for each country. There have also been financial contributions from partner governments to other aspects of AFCAP projects, for example the extension of AFCAP training activities in Mozambique and the cost of consultative workshops and manuals printing in Ethiopia. The total value of non-DFID contributions to AFCAP is estimated at £12 million³⁰. The contributions of partner governments to AFCAP projects are an important component of the government buy-in to the process and ownership of the outputs.

³⁰ This is the estimated contribution to date from Ethiopia, Mozambique, Malawi, Tanzania and Kenya. For details see Quarterly Report 17 (January to March 2013). Contributions to date by South Sudan and DRC are very small.

3.2.3 Concrete Examples of Change

The third Outcome indicator is only expected to be fulfilled by 2020. A target of 200,000 km of rural roads influenced by AFCAP research has been set. This is about 48% of the total classified rural road network in the AFCAP participating countries. The likely influence of AFCAP on the network is summarised as follows:

- In **Ethiopia** the new manuals and contract documentation are in use on the Universal Rural Roads Access Programme. URRAP is expected to improve 60,000km of *wereda* roads to all weather standard by 2015.
- In **Tanzania** the AFCAP District Road Maintenance project will have influence over 58,000km of district roads, assuming the recommendations are formally adopted by the government and implemented by the districts.
- The rural road network in **South Sudan** is estimated as 12,000km, which is the network that existed before the civil war. About 40% of this network was re-opened by 2010 through emergency works implemented by the United Nations agencies. Further reopening of roads and improvements to the network will be informed by the new manuals currently under preparation through AFCAP. The government has also identified 8,700km of trunk roads that will be upgraded to a paved standard by 2023³¹, though shorter term plans are less clear and will depend on an improved security situation and resolution of the ongoing disputes with Sudan to the north. It can be expected that some of the trunk roads will carry low traffic volumes for their expected design life, and may be designed to low volume sealed road standards using AFCAP design approaches.
- In Malawi, Mozambique and Kenya the AFCAP research has focussed on sealing of higher traffic gravel roads, rather than the provision of all classes of low volume roads. Roads that are viable for upgrading to paved road standard comprise a relatively small part of the rural road network. For example they include only about 3,000km in Malawi³² and 5,000km in Mozambique³³. Furthermore, these roads will only benefit from AFCAP research if the governments allocate funds for upgrading the roads to paved standard. This will not be achieved by 2020, but Kenya aims to construct 1,228km of low volume sealed roads in the period 2013 to 2018³⁴ and Mozambique has allocated £39 million for sealing low volume roads in the 2013/2014 investment programme, covering 280km of roads³⁵. Malawi expects to construct 60km of low volume sealed roads in 2014 under the Agriculture Sector Wide Approach (ASWAp) with multi-donor funding coordinated by the World Bank.^{36, 37}

From the above analysis it is evident that AFCAP may directly influence about 130,000km of roads in the participating countries by 2020, indicating that the target of 200,000km may have been ambitious. Nevertheless, the network of 130,000km represents about 31% of the entire classified road network in the AFCAP participating countries³⁸.

3.3 Impact Indicators

At Impact level on the Logframe it has not been possible to monitor progress because even the revised Impact indicators cannot be verified. Of the five countries identified for monitoring the Rural Access Indicator (RAI), only Ethiopia conducts annual surveys to collect the relevant data. Data on *sustainable* road maintenance is similarly difficult to obtain. Furthermore, AFCAP does not fund road improvements or road

³¹ Government of South Sudan. Infrastructure Sector. **Budget Sector Plan**. 2011-2013. July 2010.

³² This is the official length of the "secondary" road network as reported in the Malawi **Road Network Reclassification Study Final Report** (Ramboll, 2004).

³³ This is the length of the secondary road network identified in the **The Reclassification of the Mozambican Road Network Phase 3 Report** (Hifab International, 2003).

³⁴ Kenya Rural Roads Authority. **Strategic Plan**. 2013-2018.

³⁵ Ministério das Obras Públicas e Habitação. **Integrated Road Sector Program**. PRISE. 2012-2014.

³⁶ Email from World Bank Senior Transport Specialist (World Bank Malawi Country Office). 22 January 2013.

³⁷ The cost of construction of a low volume sealed road varies from about £60,000 to £200,000 per kilometre.

³⁸ The total classified network used in this calculation includes a very substantial road network in DRC estimated at 152,000km, as assumed by DFID in the draft Business Case for "Roads in the East of DRC Phase 2". 2012.

maintenance; the contribution of AFCAP to these indicators is through increased awareness of the importance of rural access, capacity building in the sector, and providing the tools (through research and knowledge management) for government agencies and practitioners to use sector funding more efficiently. In addition, the component of AFCAP research concerned with appropriate standards for paved roads may not contribute significantly to the RAI; most roads that are upgraded to paved road standards are already passable at all times of the year. The contribution of AFCAP to the rural transport sector is therefore not measured accurately by the Logframe indicators, even if reliable data could be collected. This constraint was noted in the DFID Annual Review of 2012.

Despite the limitations of the Logframe indicators there is evidence that AFCAP is having an impact on the rural transport sector in Africa, and can be expected to contribute to further improvements over time. Examples are given below.

Design Standards for Low Volume Sealed Roads

The adoption of the DCP design approach by Malawi has considerable implications for the region. It will be easier for other countries to follow the Malawi lead. For example the DCP catalogue is being included in new guidelines for the use of sand in road construction that are being developed under AFCAP for the SADC region. If the government partners agree it will also be included in the final version of the Ethiopia Low Volume Roads Design Manual, the new South Sudan Low Volume Roads Design Manual, and a proposed new DCP Pavement Design Manual for Mozambique.

The overall impact on LVSR construction costs for the region from adopting these standards will be considerable. The Malawi Road Authority has experience in the construction of low volume sealed roads using both conventional and the "LVSR design approach". This experience shows that roads built in accordance with the conventional pavement design approach are up to three times more expensive than those built to the LVSR approach³⁹. Therefore the cost saving on the construction of 60km of LVSR under ASWAp as a result of using the new design manual and specifications may exceed £10 million⁴⁰. This alone is a significant proportion of the entire cost of the current phase of AFCAP.

Countries such as Kenya are planning much larger investments in LVSRs than Malawi, and will derive correspondingly larger benefits from adopting standards developed under AFCAP. The budget for the construction of 1,228km of paved rural roads in Kenya under the 2013-2018 Strategic Plan is based on a cost per kilometre of £600,000⁴¹. The adoption of LVSR design standards and the DCP design approach could be expected to result in construction cost of one third of this amount. The potential saving is £490 million⁴².

District Road Maintenance

The principal output of the Tanzania District Road Maintenance project is a manual providing detailed guidance on the implementation of various identified maintenance contracting options. It is expected that this manual will be used by the majority of district authorities in Tanzania. These local authorities are responsible for a total network of 58,000 kilometres. Between them they administer an annual budget of about £48 million⁴³, yet it is estimated that 44% of the Tanzania district road network is in poor condition⁴⁴.

³⁹ Pinard, M.I. (2011).

⁴⁰ The budget for construction of sealed roads under ASWAp is \$15 million, equivalent to about £10 million. According to Malawi Road Authority experience the cost of a conventional paved road design is at least twice the cost of a LVSR design. Therefore the saving by adopting the LVSR approach is estimated to equal or exceed £10 million.

⁴¹ Derived from investment targets given in Kenya Rural Roads Authority. **Strategic Plan**. 2013-2018.

⁴² An average cost of construction of £200,000 per km is assumed for low volume sealed roads in Kenya based on regional experience. This is one third of the cost of £600,000 per km assumed in the KeRRA Strategic Plan. A saving of £400,000 per km over 1,228km would amount to £490 million. The low volume sealed roads design alternative would likely have lower geometric design standards in order to extract maximum benefit from consolidation of the existing gravel road and therefore would provide a lower level of service than a conventional design, albeit at considerably lower cost.

⁴³ IT Transport. **Consultancy Services For Development Of Local Government Transport Plan To Full Implementation**. Draft Final Report. January 2013.

⁴⁴ IT Transport. **Consultancy Services For Development Of Local Government Transport Plan To Full Implementation**. Draft Final Report. January 2013.

There is considerable room for improvement in current practice, which will be supported by the AFCAP manual.

It is unlikely that the use of AFCAP maintenance guidelines that have been developed for both Tanzania and Ethiopia will enable the government to reduce expenditure on district road maintenance; but it can be expected that the maintenance will be carried out more effectively. The maintenance will also cover a greater proportion of the network. This means that there will be less disruption to rural access during the rains and added transport options for local communities. Transport operators will be able to service routes with greater confidence that they will not encounter sections of road that are impassable, require excessive journey times, or suffer damage to their vehicles.

4 Unplanned/Unintended Outcomes and Impacts

4.1 Changes in Geographic Reach

Representatives from Ethiopia, Ghana, Kenya, Malawi, Mozambique, Tanzania, South Africa and Zimbabwe were directly involved in the design of AFCAP and the initial identification of project activities⁴⁵. These were countries where DFID had recent programmes in the road sector. By the time the implementation phase of AFCAP started (2008) the UK no longer had bilateral relationships with the Government of Zimbabwe and it was not possible for Zimbabwe to participate in AFCAP. South Africa was seen principally as a resource for AFCAP rather than a recipient of AFCAP support, and the Ghana authorities indicated that they had already received sufficient support through a long term DFID technical assistance programme in the rural roads sector. Initial activities, therefore, focussed on Ethiopia, Kenya, Malawi, Mozambique and Tanzania. It was evident to the AFCAP Management Team that five countries was the maximum that could be managed effectively with the available resources.

In 2011 additional resources were added to the management team for AFCAP and it was possible to increase the number of participating countries. At the time DFID was developing road sector support programmes in South Sudan and DR Congo. It was evident that AFCAP work on design standards for rural roads would be highly relevant to these two countries, and the governments of both countries were enthusiastic about participating in the programme.

South Sudan and DRC are, however, both involved in conflicts and this has affected the development of their AFCAP activities. For example it may not be possible to proceed with the planned design of a research section in the South Kivu in eastern DRC due to ongoing security risks. In South Sudan AFCAP has focussed on the preparation of a design manual for rural roads based on the Ethiopia model; but a project to collect base line data in Bahr al Ghazal State where DFID plans to finance a road improvement project is on hold due to security concerns. Support to conflict-affected countries has been an unintended outcome of AFCAP.

AFCAP is also supporting research projects for Transport Services in Nigeria, Zambia and South Africa, but these are small projects implemented by NGOs or University research groups and no formal agreements have been signed at government level. In Southern Africa AFCAP is supporting a research project with the Association of Southern Africa National Road Authorities (ASANRA) to develop guidelines for the use of sand in road construction. This project has direct influence on the thirteen members of the Southern Africa Development Community (SADC).

4.2 The development of a Transport Services component

The AFCAP log frame in the Project Document includes reference to research on transport services on rural roads, but it appears that transport services were not perceived as a priority during the design phase. All of the projects developed during the design phase were concerned with the engineering aspects of rural roads. The underlying rationale for AFCAP was seen at that time to be to take forward the work done previously for the development of the SADC Guidelines for Low Volume Sealed Roads in order to operationalise those guidelines and extend the concepts across a wider geographical area.

Two years into the implementation of AFCAP, a decision was made by DFID and the AFCAP Steering Group to strengthen the transport services component of AFCAP. This included engaging transport services professionals on the AFCAP management team to identify and manage a portfolio of transport services research projects. The initial consequence of this decision was a disruption to the engineering research projects that were already underway, as DFID sought additional resources for the programme. Subsequently, a call for transport services proposals was made, but only a limited number of very small-scale research projects were commissioned. More recently, however, efforts have been made to build the transport services component with projects that are specifically focused on complementing AFCAP's road infrastructure research. This includes the Transport Services Indicators Project, a review of the impact of the

⁴⁵ Draft Project Document.

DFID-funded Zambézia Feeder Road Project in Mozambique (1996 to 2002)⁴⁶, and a project in Tanzania on road safety. These projects are helping to increase the synergies between AFCAP's engineering and transport services research.

The practical guidelines for the safe operation of *boda-bodas* which are being developed under the Tanzania road safety project may have far reaching implications for the region. *Boda-bodas* have become the predominant form of public transport in rural areas in Tanzania, Kenya and Uganda. They are becoming increasingly important in Ethiopia, Mozambique, Malawi and South Sudan and elsewhere in Africa (not least Nigeria). Their use is, however, unacceptably dangerous, with minimal protection provided for the driver, the passenger, or other road users. If safer operations can be promoted (without undermining the growth of the industry), there will be benefits for millions of men, women and children in Africa.

The challenge for AFCAP is to develop an appropriate advisory code for *boda-boda* operations based on the outcome of the research activities, and to convince the authorities that this should be promoted, for example through mass media campaigns. To this end Amend has been working closely with Local Government Authorities in the project areas and their parent ministry (PMORALG⁴⁷). Amend has also established links with the National Institute for Medical Research in the Ministry of Health and Social Welfare which oversees their research work. Road safety education activities in schools are carried out with authority from the Ministry of Educational and Vocational Training, and *boda-boda* driver training is carried out in conjunction with the Vocational Education and Training Authority. The Traffic Police (Ministry of Home Affairs) are informed of all Amend activities on the roads, and Amend is collaborating with the police for the establishment of an Interim Secretariat for the National Road Safety Council, and the organisation of a conference for the Global Road Safety Week.

Additionally, efforts are now being made towards greater attention to gender issues within AFCAP. This includes the collection of gender-disaggregated traffic data in all transport services projects and in the assessment of road engineering impacts. An example is the social impact study carried out on a road in Siha District in Tanzania that was being upgraded to all weather standard, under an AFCAP research project on pavement design and surfacing⁴⁸. The inclusion of a stronger transport services component in AFCAP supports the move towards gender mainstreaming, given the strong social science emphasis in the transport services sector and its typically more gender-balanced practitioner community.

In order to support capacity development in the rural transport services sector in AFCAP countries, a new pilot transport services training course has been developed. Although the course is aimed at transport professionals and academics in government, the private sector and universities, road engineers have also expressed interest in participating. The course will promote recognition of the crucial role which transport services play in improving rural access.

4.3 Local Research Capacity

The true impact of AFCAP goes well beyond the log frame expectation of improvements to the RAI and the length of road being maintained in Africa. AFCAP's most important legacy is likely to be enhanced capacity in participating countries to undertake their own research in the road transport sector, and to more effectively manage their knowledge base. This level of achievement was not anticipated in the programme design, which expected "a sustainable rural access research programme installed in **one** country" by the end of the first five years of AFCAP⁴⁹. At present there are indications that Ethiopia, Mozambique and Kenya will all complete formal institutional arrangements to support a research programme by the end of the current phase of AFCAP. Tanzania and DR Congo have made significant progress in developing strategies for establishing their own research capability, and Malawi is committed to strengthening the Technology Transfer and Research Centre at Blantyre Polytechnic. The Government of South Sudan has decided to

⁴⁶ Thompson, S. and Pedro, C. **Feeder Roads Project Zambézia: Follow-Up Assessment**. Mozambique. SCDS. December 2012.

⁴⁷ Prime Minister's Office - Regional Administration and Local Government.

⁴⁸ Roughton International. Research Consultant to Support the Design, Construction and Monitoring of Demonstration Sites for District Road Improvements in Tanzania. **Sociology Report**. Draft, 2012.

⁴⁹ *Draft Project Document*.

restructure the Ministry of Roads and Bridges to include a fully-fledged department responsible for research and development for the roads and buildings sector. AFCAP has been requested to provide technical assistance this new arrangement.

The construction of trial sections of road in Mozambique, Kenya and Ethiopia has not only provided for the demonstration of best practice and alternative technologies; it has also provided the government with the basis for a long term research programme. Technical monitoring systems have been established on every trial section, with national staff participating in the collection of baseline data. This will enable local research centres to establish their own trial sections in the future. The monitoring of the performance of roads is the most fundamental task of any road research facility.

Most of all, AFCAP has succeeded in demonstrating the value of research in the transport sector and has ensured that this message is received by senior policy makers. The demand-led and participatory approach adopted by the management of AFCAP has fostered buy-in and support from high levels in participating countries. AFCAP influence has spread widely in the region and there is continued demand from non-core countries to participate more actively in the programme. The AFCAP brand has become increasingly well known and respected in the region, but will require long term support if the outcomes achieved to date are to translate into sustainable long term impact.

“Currently there is provision for funding for research through projects managed by DIPRO (Directorate of Projects) in ANE. This is done through a budget line in the Department of Studies & Projects where a certain percentage of the budget for major projects is earmarked for trial/research sections. Unfortunately, in the past this budget has rarely been utilised but with introduction of a dedicated AFCAP-supported Research Unit with specific mandate to conduct research, the Director General expressed confidence that this could be increased further.

“Regarding budget allocations for research from the fiscus, ANE and the MOPH (Ministry of Public Works) representative indicated that it would be possible to earmark up to 1% of project budgets to research provided a good case is made to politicians on the value and benefit of research. It was agreed at the workshop that this could be done through embarking on highly-publicised quick-win projects as the first order of business by the soon to be established Research Unit at ANE”.

Source: Discussion at Road Strategy Workshop in Maputo March 2013

5 Appraisal

The AFCAP Theory of Change is based on a virtuous cycle of research leading to demonstration of best practice, which leads to capacity development to undertake further research and so on. This cycle is illustrated in Figure 1 below. External support is provided through AFCAP to each stage. Capacity development in this context includes policy uptake, building institutional structures, achieving sustainable funding and developing human resources. The key issue is that these arrangements, when instituted at a country level, have the potential to be self-sustaining without permanent reliance on AFCAP or a similar type of support.

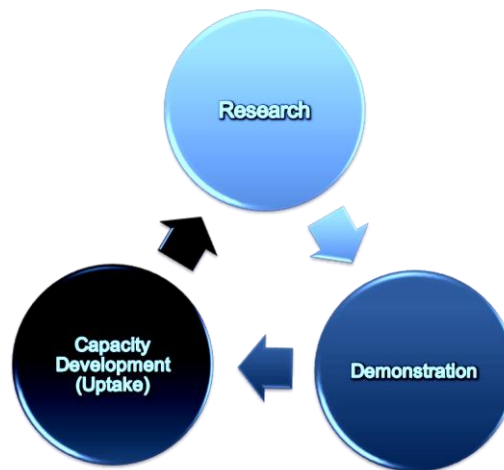


Figure 5: AFCAP Theory of Change

The approach adopted by AFCAP marked a departure from previous DFID-funded transport research initiatives in Africa. These initiatives tended to rely heavily of UK experts, who returned to the UK with the findings of their work. There were of course exceptions, for example the Overseas Road Notes prepared by TRL, which are still referred to widely in Africa, and the SADC Guidelines for Low Volume Sealed Roads, which were disseminated effectively in the region. However, neither the Road Notes nor the SADC Guidelines have the status of an official government document. They do not include specifications that can be included as part of road works contracts. The high levels of collaboration achieved by AFCAP with local partners gave the programme sufficient credibility to ensure that the key outputs would be adopted as government policy in the participating countries. Many of the AFCAP outputs build directly on the Road Notes and the SADC Guidelines, facilitating the uptake of the principles that they contain.

The AFCAP approach did not come without risks. In Ethiopia AFCAP is supporting a research project which includes the construction of trial sections of road in four regions. After one year of implementation it was evident that the success of the project depended too heavily on the consultants who were contracted by Crown Agents to manage it. The Ethiopian Roads Authority (ERA) was not sufficiently involved in the process, and the project was floundering at the first step of identifying sections of road. Without strong ERA buy-in there was a risk of the project failing, since ERA would be financing the construction works.

A decision was made to formally transfer responsibility for project implementation away from the consultants and to ERA. This included a signed Memorandum of Understanding between ERA and Crown Agents which described the responsibilities of each party. The consultant's contract was revised as a call-down form of contract, with inputs provided only in response to requests from ERA. This change resulted in a six month delay as agreement was sought from the consultant and the formal arrangements concluded.

The revised consultancy contract was smaller in value (£368,000) than their original contract (£819,000), resulting in a considerable saving to the programme. However, the new project management arrangements

may not have resulted in greater efficiency in achievement of the project objectives. By March 2013 only three trial sections had been completed, more than two years after the revised management arrangements were put in place. Of these three sections, two still required the construction of a second surfacing. ERA lacked capacity to manage the project on a day to day basis, with staff in the Research and Development Directorate overstretched. ERA has not been able to attract and retain experienced staff due to their low salary structure in relation to the private sector. Construction of the trial sections was fraught with difficulties in the supply of materials, provision of equipment on site etc. ERA seemed powerless to resolve these constraints. The inefficiencies in the management of the project resulted in inefficient use of time by the AFCAP consultant.

Nevertheless, once visible work on the trial sections was complete there was a clear sense of achievement on the part of ERA, and pride in the work that had been done. Lessons have been learned that will result in more efficient implementation of similar projects in the future. There is a true sense of ownership of the process, thus vindicating the decision to change the management arrangements mid-way through the project.

The construction of trial sections in Tanzania, Mozambique and Kenya also relied heavily on the organisation of the works by the road agencies. The funding for the works was provided by the governments, who were the Client for the works. The funding came either from the government's own resources or from contributions by other development partners to the sector. Across the whole programme the total amount invested by governments is about £12 million, compared to the contribution by DFID's Research and Evidence division to AFCAP of £13 million.

The government contributions signified considerable buy-in to the process and commitment to AFCAP's success. The involvement of road agency staff heightened their awareness of the importance and value of research, thereby increasing the demand for establishing their own, in-country, research facilities. These research facilities will be responsible not only for conducting further research in the sector, but also for the management of knowledge and the updating of technical documents including manuals and specifications.

The achievements of the current phase of AFCAP mark only the start of a process to establish a vibrant research community for the rural road transport sector in Africa. Research work requires long term commitment and deep technical knowledge. Research in the sector is currently mostly in the hands of engineers, but they are not necessarily well suited to all aspects of the task. Most engineers prefer to see visible change in a relatively short period of time. Reliable conclusions from trial sections may, for example, only become apparent after 10 years or more. Engineers may also not have sufficient depth of understanding of the behaviour of materials, and the social and economic aspects of roads and road transport. For this reason it is necessary to recruit experts with a wider range of skills into the research community in Africa, including sociologists, economists, physicists and geologists.

Establishing local research capacity for the road transport sector in African countries is a long term endeavour. It may take fifteen years or longer before governments are in a position to finance a research programme and retain suitably qualified staff. Capacity development is needed not only at national level, but also at regional level within the economic communities (RECs) in southern, east and west Africa. These regional bodies have a key role in supporting national programmes and ensuring effective knowledge sharing. Consideration should be given, for example, to establishing regional research hubs that provide direct support to research units in the individual countries. The operation of these research hubs would be overseen by the RECs. It is reasonable to expect that this arrangement could be achieved within a five or ten year time frame; but long term support from a programme such as AFCAP will be a critical factor in the process.