# SEACAP AND AFCAP: PROGRAMMES TO STIMULATE INNOVATION THROUGH RESEARCH IN THE PROVISION OF RURAL ACCESS

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## Abstract

Safe, affordable and sustainable access is important for poor communities in less developed countries. Good roads and efficient and effective transport services facilitate access to education, health, employment opportunities and other services essential for economic and social development and in achieving the benefits from investment in these sectors. A paradigm change in approach to rural access is required if the poverty reduction targets in the millennium development goals are to be met. The ability of local engineers to identify problems and to be innovative in the planning and design of roads that provide cost-effective accessibility is a key factor in achieving these goals.

This paper describes how Collaborative programmes such as the South East Asia Community Access Programme (SEACAP) and a similar programme in Africa (AFCAP) funded by the UK Department for International Development (DFID) are designed to provide opportunities in education, research and training that stimulate innovation. The programmes enable local engineers to carry out research and to plan and design innovative practical demonstration projects that meet the access needs of poor people with an objective of delivering programmes that are locally resourced and appropriate for local circumstances.

The limited research capacity of educational institutions in many less developed countries is often a major constraint to innovation. Local practitioners are often unaware of the impacts of research and examples are provided of the quantifiable benefits from past transport research projects. Links with academic institutions have resulted in innovative approaches being included in the curricula of engineering training courses, thus increasing awareness of the benefits of research and innovation in the training of local engineers

## Introduction

Investment in transport projects in urban centres is often aimed at providing "high-tech" solutions for moving large numbers of people around cities as quickly as possible. Such solutions are important for continuing economic advancement. In rural areas in less developed countries, the imperative is to provide people with year-round safe and sustainable access to basic services such as health centres, schools, employment opportunities and other services are essential for economic and social development.

An essential ingredient in the provision of reliable transport services is a road network that is maintained in a condition that facilitates all weather access for transport services throughout the year. In many African countries, up to 80 per cent of the road network is unpaved and in many parts of Asia the rural road network is also constructed of earth or gravel. In parts of many countries gravels for road construction are simply not available and even in countries with gravel resources, these are rapidly depleting. Maintaining unpaved roads to a standard that ensures sustainable access is thus becoming an increasingly difficult task.

The challenge for engineers working throughout Africa and Asia is to find cost-effective solutions that enable the provision of rural road infrastructure that is durable and maintainable. This requires a paradigm change in approach to rural access. The ability of local engineers to identify problems and to be innovative in providing solutions that provide sustainable cost-effective access for the rural poor will be a key factor if the poverty reduction targets in the millennium development Goals (MDG's) are to be achieved by 2020.

The evidence that innovative solutions will be appropriate, applicable and effective is often derived through research.

It is, therefore, important that engineers are made aware of the important contribution that research can make to the development process as part of their education and training.
There is a need for engineers to be trained not only in good engineering principles but with the skills to be innovative and also knowledgeable in alternative sustainable development techniques when conventional specifications are not affordable and appropriate materials are unavailable. Engineering education establishments, therefore play a vital role in ensuring that engineers are aware of the potential impacts and benefits of research and innovation.

## Research in the transport sector

One definition of the differences between consulting and research is that in consulting 'the needs are defined and the solutions known' and in research 'the issues are defined but the outcomes are unknown'.
Research is the mechanism for the advancement of knowledge and for social and economic progress worldwide. It is the proven approach for developing and testing new and innovative idea and the results of successful research, combined with demonstration projects, enable practitioners to adopt and apply new and innovative approaches with confidence.
Sustainable development is the goal of most international development agencies and it is accepted by the UK Department for International Development (DFID) that transport is essential for sustainable development and has a direct impact on most of DFID's aims. The World Bank is also committed to improving the sustainability of the sector through increased efficiency and making the supply of transport services more responsive to the needs of users(1). Knowledge derived from research is an essential ingredient for sustainable development in that it provides the information necessary for decision making.
Unfortunately, the transition from successful research/demonstration to the implementation and mainstreaming of new technology is often a difficult process. For example, in the UK, it has been reported that "although the UK has a good track record in the intellectual aspects of Research and Development, it tends to be less equipped to apply and exploit the results and that somehow, the country's undoubted technical ability often fails to be carried through to application(2) . Therefore, it seems that the process of transference of knowledge into practice might well be a universal problem and the South East Community Access Programme (SEACAP) and a similar programme in Africa (AFCAP) are designed to facilitate the implementation of good evidence-based knowledge derived through research.
Research is seen by many as a luxury but without it, few of the scientific and engineering advances would have been possible. Visual evidence of the contribution of research to technological development can be found in almost every facet of our lives and this includes roads and transport. Researchers in the sector, in collaboration with local practitioners, are constantly undertaking research and demonstration projects to develop new techniques, improve the use of local resources and raise awareness by practitioners of alternative approaches in the provision of roads and transport services.

## The need for research in developing and emerging countries

The transport problems in developing countries require local solutions that are inherently different from those in more developed countries. The prevailing climate is often different, which has a considerable influence on road design and performance. The mix of traffic on both urban and rural roads is different from developed countries and also often differs between developing countries. The modes of transport are also different. In many developing countries, large numbers of pedestrians, pedal cyclists and users of various forms of non-motorised transport (NMT's) compete with motorcycles, cars, trucks and buses for the use of the available road space.
The safety of all road users in developing countries is of increasing concern. Over 3,000 deaths occur from road accidents every day worldwide with 85% of these in developing countries(3). This is not only an enormous human tragedy but it comes with a severe economic cost. Some developing countries lose as much as 3% of GDP due to road accidents.
Road traffic fatality rates in the developed world have decreased markedly over the past 20 years, mainly through the introduction of road safety legislation, awareness and training based on research. Unfortunately, accident rates in the developing world continue to rise with the poorest road users, such as cyclists, user of NMT's and pedestrians being

particularly vulnerable. Another worrying statistic is that whilst pedestrians form between 13% and 20% of road casualties in the USA and Western Europe, this rises to between 50% and 60% for developing countries.(4)

The programmes highlighted in this paper are aimed primarily at improving safe and sustainable access for the rural poor but the mobility of the urban poor is also of concern. A significant movement of the rural population to urban centres is underway in many developing countries as the rural poor seek access to economic opportunities in the hope of improving their livelihoods. In some countries where most people once dwelled in the rural areas, the urban population now exceeds 60% of the total population. It is estimated that in Asia, by 2020, 4 billion people will be living in 2,500 cities with populations exceeding 100,000. The effect of urban population growth on traffic congestion is already apparent in many towns and cities in Asia and elsewhere. The problem of moving people in these cities is is one that will exacerbate in the future. Research will also be required to devise solutions to meet the mobility needs of the urban poor.

All these problems require specific local solutions and research is an important mechanism for deriving appropriate solutions and promoting innovation.

Thus, research effort is needed in most of the areas related to transport. Collaborative research is effective, only if it fully involves local practitioners, education institutions and local research facilities. Community participation is key to the acceptance and implementation of projects based on research evidence. The involvement of local practitioners, institutions and communities is vital in identifying local problems associated with the provision of access and transport services and in helping devise solutions that meet the need for safe and sustainable access and greater mobility for people living in urban and rural areas of the developing world.

## Benefits from transport research

The outcomes of the majority of transport research projects tend to be beneficial. The benefits of research aimed at influencing policy are difficult to evaluate in monetary terms as are research projects that yield social or environmental benefits.

Many of the benefits from pro-poor transport initiatives yield benefits that are predominantly social, such as facilitating visits to health centres, opening up employment opportunities, providing improved access to education etc. It is often difficult to quantify these benefits in monetary terms, even if there is alternative evidence that the results of the research, when implemented, have a positive impact. The importance of identifying these benefits is now well recognised as is the need to quantify them in monetary terms wherever possible.

Collaborative research with government agencies and the private sector in developing countries presents opportunities for technology transfer, training and institutional strengthening. These benefits of research are also not easily quantifiable in economic terms but they are recognised as an important developmental component of collaborative research. As a result of these constraints, studies to evaluate the benefits of transport research have often been confined to projects that yield benefits that can be quantified in monetary terms using conventional economic indicators.

A major study on the benefits and costs of transport research projects at the Transport Research Laboratory (TRL) in the United Kingdom was carried out in 1995 (5) and the results are summarised in Table 1.

Table 1 Summary of Measures of Return on research – central estimates

| Purpose of Research | Cost of research<br>£m | Average Benefit over 20 yrs<br>£m | NPV from 1992 base<br>£m | NPV/PV of research | IRR<br>% |
|---|---|---|---|---|---|
| Reducing road construction and maintenance costs | | | | | |
| (a) Soil nailing | 0.48 | 3.3 | 25 | 43 | 51 |
| (b) Reinforced embankments on soft soils | 0.75 | 2.6 | 26 | 28 | 60 |
| (c) Off-site recycling of bituminous materials | 1.21 | 15.0 | 114 | 75 | 56 |
| (d) Strengthening masonry arch bridges | 0.1 | 0.2 | 1.7 | 14 | 45 |
| Saving accidents | | | | | |
| (a) Effect of macrotexture on accidents | 2.6 | 284 | 1783 | 447 | 49 |
| (b) Seat Belt wearing | 8.59 | 112 | 3241 | 73 | 33 |
| (c) Accidents at roundabouts | 0.62 | 14 | 142 | 106 | 50 |
| (d) Urban safety management | 5.35 | 62 | 526 | 28 | 44 |
| (e) Front under run guards on HGV's | 0.66 | 20 | 107 | 91 | 31 |
| Cutting congestion | | | | | |
| (a) Roadworks on motorways | 0.57 | 11 | 109 | 165 | - (a) |
| (b) SCOOT urban traffic control | 3.92 | 54 | 942 | 112 | 73 |
| (c) MOVA self-optimising signal control | 2.23 | 32 | 248 | 69 | 43 |
| Average for 12 projects | 2.26 | 51 | 605 | 104 | 49 |

*Source: TRL Project Report 86*

(a) Implementation of the research on "road works on motorways" began within one year of the start of the research, which is unusual. The IRR is very sensitive to early returns and gave a value in excess of 1400% for this project.

Perhaps the most significant conclusions from the study were that all twelve projects in the study would pay for themselves within less than 6 months and that the annual benefits for the 12 projects over 20 years was 15 times the annual costs of all TRL projects (over 400) being undertaken in the base year for the UK Department of Transport.
However, there is relatively little evidence available that provides a broad quantitative overview of the cost effectiveness of transport research worldwide, particularly in developing countries. Individual projects are occasionally subjected to economic evaluation but there is little evidence of the economic case for global investment in transport research.
DFID investment in transport research in SEACAP and AFCAP is primarily into improving the cost -effective delivery and sustainability of access roads for the rural poor in emerging and developing countries. However, it is recognised that research in road infrastructure is just one component of investment in transport research and numerous examples are available of the benefits from research by other donor agencies and by DFID both in engineering and in the broader transport sector (such as road safety, public transport operations, etc).

## Funding for transport research

In the period up to 2020, investment in the transport sector in Asia alone is expected to be of the order of $2 - $3 trillion(6), which probably equates to a crude global estimate of the order of 4 – 5 times greater than this figure.
UK government research commissioned in 1995 indicated that for every £1 million spent on research, society in the UK benefited by over £20 million annually, which provides adequate evidence of the benefits of research. However it is still often very difficult to acquire funding from international development agencies for transport research. This problem is compounded by the constrained research capacity at many academic institutions in developing countries. For their knowledge base, they rely heavily upon research carried out by institutions and programs from more developed counties. This can also be problematic if this knowledge base is not carefully adapted for the specific environment of the developing country, as is often the case.
It is difficult to estimate the amount spent globally on transport research. Of one thing we can be certain and that is that it is a tiny fraction indeed of the amount expended globally in the sector. The reluctance to fund research is surprising considering the significant historical benefits that have accrued from research in the sector.
In the UK, DFID supports research projects in the transport sector as an important part of its development pro-

gramme for improving rural livelihoods. The World Bank also continues to recognise the important role of transport in the development process and 20% of its budget is devoted to transport.

For many years, DFID also funded an Engineering Knowledge and Research Programme (EngKaR) which resulted in many advances in knowledge. The transport component of this research programme was designed specifically to address problems in roads and transport in developing countries. Much of this research has been conducted by the UK Transport Research Laboratory (TRL) on behalf of DFID. Implementation of DFID-funded research at the TRL was facilitated by the "Overseas Road Note" publications that are seen as definitive documents for developing countries on transport policy. The EngKaR programme has been discontinued but current transport research is being incorporated into programmes such as SEACAP and AFCAP. Other multinational and national development agencies such as the World Bank, NORAD, SIDA, Ireland Aid, have also funded research that has led to revised standards, specifications and innovation in the sector(7)..

DFID continues to fund transport research in developing countries by providing both bi-lateral and multilateral support with international partners. Its current support for transport research is around £4 million annually.

## SEACAP

DFID is funding the South East Asia Community Access programme (SEACAP) with support from local governments, the World Bank and the Asian Development Bank (ADB). It is a poverty-targeted transport initiative within the gTKP framework. SEACAP is aimed at improving the sustainable access of people in rural communities to health, education, employment and trade opportunities with projects currently in Cambodia, Laos PDR and Vietnam.

SEACAP provides funding for applied research, communicating the research outcomes to stakeholders and supporting the mainstreaming of solutions derived from research. The programme identifies and supports the uptake of low-cost, proven solutions for rural access. It focuses on the needs of both rural women and men and aims to maximise the use of local resources, including labour, materials, enterprise and ingenuity.

The programme started in 2004 and has expanded to include more than 30 projects. It is probably too early to quantify the benefits of the research in economic terms. However, projects based on SEACAP research are already having beneficial impacts.

Access roads in remote areas of Vietnam were in a very poor condition denying rural communities access to education, healthcare and opportunities for economic growth. Revised specifications have enabled greater use to be made of local road-building materials, thus reducing costs and increasing the provision of roads that provide sustainable access(8).

The research on gravel roads in Vietnam has yielded valuable information on rates of deterioration and has raised serious questions about the cost and capability of authorities to maintain some gravel roads.(9) The evidence from this study also supports evidence from Africa that it may be more cost-effective in terms of whole-life costs, to construct a sealed road even for relatively low levels of traffic, if access is to be sustainable.

As a result of the research, the standards and specifications for low–volume rural roads have been reviewed in Laos, are being reviewed in Vietnam and are planned to be reviewed in Cambodia.

Evidence is emerging of the impact of SEACAP's research, dissemination and mainstreaming achievements. In Cambodia, agriculture is the predominant activity of rural people and the poorest spend 450% more time travelling 3 times farther than people with better access.(10) The impacts of improved access roads include an increase of loads by between 2 and 5 times, agricultural surplus comprise 61% of loads, 80% of market traffic is between local villages, 55% of vendors sell goods at lower prices and a 600% increase in the volume of trade. These benefits are quickly reversed if the infrastructure deteriorates. Unfortunately, preservation of the road asset remains a problem that needs to be addressed by better transference of knowledge into practice – the SEACAP objectives.

Trials have been constructed to demonstrate a variety of road construction methods and alternative surfacing techniques using local materials.(10) Technology transfer, training and education are also important components of SEACAP. The training programme has received plaudits from the collaborating government departments in the region. Training the trainers is also seen as an important way of transferring knowledge from central to provincial and district level. Overall benefit ratios for interventions in the transport sector in Vietnam are estimated to be in the range of 5% to 50%.

SIDA and SEACAP are supporting modules in education establishments to raise awareness of the benefits of re-

search and of alternative approaches to rural roads and transport provision by technicians and engineers during their training phase.
A full list of SEACAP projects can be found on the SEACAP website,
(www.seacap-info.org/?mod=home&act=project)

## AFCAP

DFID has recently initiated a similar programme to SEACAP in Africa. AFCAP will provide advice and undertake research to facilitate the delivery of safe and sustainable access for poor communities in Africa. It is based around a portfolio of research, demonstration, advisory and training projects and it is linked to the sub-Saharan Africa Transport Programme (SSATP).
AFCAP aims to 'close the loop' between research and application which has often proved elusive. The outputs of the programme are expected to feed directly into regional and national governments' rural transport policies and strategies for poverty reduction. The programme has started with projects in Ethiopia and Mozambique.
The proposed projects embrace a wide spectrum of activities in the transport sector and include topics such as road safety issues for vulnerable road users, social, and economic and gender impacts as well as opportunities for demonstrating innovative engineering solutions.
The expected outputs of AFCAP have the potential to significantly reduce the estimated $12 billion annual costs of the operation and maintenance of roads in Africa. Further information on AFCAP is available on the AFCAP website (www.afcap.org)

## Links with academic institutions.

Knowledge exchange between all the stakeholders in the programme is fundamental to both SEACAP and AFCAP. Whilst the main local partners are usually government agencies, all the stakeholders including academia, local consultants and contractors and local communities contribute fully to planning design and execution of the projects.
The capacity of academic institutions in developing countries to participate in applied research is often constrained by both financial and human resource capacity. However, academic institutions in Laos, Cambodia and Vietnam are collaborating in SEACAP through the participation of student groups in research activities, in visits to research sites, by including modules in the engineering curricula that reflect current knowledge and by creating awareness of the innovative solutions to local problems developed through research.
A similar approach will be undertaken in AFCAP and will include close collaboration with the Sub-Sahara Africa Transport Programme (SSATP) which itself has links with other regional organisations and academic institutions in Africa.
Close links are also maintained in these programmes with academic institutions (eg Birmingham University), research organisations (eg TRL) and other consultants in the UK.

## Dissemination

Research is an important component of these programmes but so too is dissemination and implementation of existing knowledge. The benefits of research can be realised only if the results of the research are known and are implemented and so dissemination of the results of the research and facilitating the implementation of evidence-based knowledge are key elements of both SEACAP and AFCAP.

### gTKP

DFID is also supporting the Global Transport Knowledge Partnership (gTKP) to facilitate the sharing of available knowledge. It is an innovative partnership working through existing initiatives established by its partners to make effective use of available knowledge and increase the capacity of less developed countries to access and apply knowledge and good practice. gTKP is a global organisation providing opportunities for networking between practitioners and the building of partnerships through its website.
gTKP 's activities are overseen by a steering group comprised of international experts with day-to-day activities managed by the Core Management Group. gTKP offers advice and support in seven theme areas. (Environment

and Climate Change, Finance and Economics, Governance, Road Safety, Rural Transport, Social Development and Urban Transport). Each theme is headed by a champion and gTKP services are free.

**TRS**

DFID is also cooperating with the World Bank on the project for Transport Research Support for inclusive growth (TRS). The aim of this programme is to facilitate interventions in the transport sector supported by the World Bank and other development partners to contribute to sustainable growth and the needs of the poor in developing countries. The programme will focus on facilitating new knowledge generation in emerging research issues and the application of lessons learned. Early project subject matter includes transport project stimulus in the economic downturn, facilitating freight movement and sustainability audits.

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