



AFCAP



Preparatory Activities for Transformation of the MTRD into a Transport Research Centre/ MTRD Draft Strategy for Upgrading of 8,000 Km of Unpaved Roads to Low Volume Sealed Standards in 2013 – 2017 Plan Period

PART B

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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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List of Abbreviations

AFCAP African Community Access Programme
AfDB African Development Bank
AFD Agence Française de Développement
CER Chief Engineer Roads
CTSC County Transport and Safety Committees
DANIDA Danish International Development Assistance
DG Director General
DP Development Partner
EC European Commission
EDF European Development Fund
EDMS Electronic document Management System
EIA Environmental Impact Assessment
Eoi Expression of Interest
ERB Engineers Registration Board
EU/EUD European Union/European Union Delegation
GDP Gross Domestic Product
GIS Geographic Information System
GoK Government of Kenya
HMMS Highway Maintenance Management System
HRD Human Resource Development
ICBTRS Institutional Capacity Building to the Transport/Road Sector in Kenya
ICT Information and Communication Technology
IDA International Development Association
ILO International Labour Organisation
INTP Integrated National Transport Policy
JICA Japan International Cooperation Agency
KeNHA Kenya National Highways Authority
KeRRA Kenya Rural Roads Authority
KfW Kreditanstalt für Wiederaufbau, German Development Bank
KIHBT Kenya Institute of Highways and Buildings Technology
KRB/KRBF Kenya Roads Board/Kenya Roads Board Fund
KRC Kenya Railways Corporation
KSh Kenya Shillings
KURA Kenya Urban Roads Authority
LVSR Low Volume Sealed Roads
MoF Ministry of Finance
MoLG Ministry of Local Government
MOTI Ministry of Transport and Infrastructure
MTD Mechanical and Transport Department
MTRD Materials Testing and Research Department
NCA National Construction Authority
NEMA National Environment Management Authority
NRSAP National Road Safety Action Plan
NRSC National Road Safety Council
NTSA National Transport Safety Authority

**Draft Strategy for Upgrading of 8,000 Km of Unpaved Roads to Low
Volume Sealed Standards in 2013 – 2017 Plan Period**

PPP Public Private Partnership

PS Principal Secretary

QA Quality Assurance

QC Quality Control

RACECA Road and Civil Engineers Contractors Association

RO Regional Office

R2000 Roads 2000

RSIP Road Sector Investment Programme

SAGA Semi-Autonomous Government Agency

SIDA Swedish International Development Agency

TA Technical Assistance

ToR Terms of Reference

INTRODUCTION

This report sets out a strategy to achieve the Government policies for delivery of upgrading of Low Volume Roads relating to construction, rehabilitation and maintenance. It also addresses methods of reducing Whole Life Costs (WLC) of roads by 25%. It describes the scale of the challenge to achieve upgrading of 8,000km of LV roads to paved standard and the paradigm shift that will be necessary to accomplish the targets. It then describes the role of Research and Development (R&D) to support the programme and maps out the research areas to provide the innovation and technical guidance to enable the step changes to be made.

Transforming Kenya

The Kenyan Government Coalition's Manifesto for Transforming Kenya (2013 – 2017) sets out an agenda for economic growth under three Pillars:

- Unity
- Economy
- Openness

Under the Second Pillar, the Manifesto sets out its agenda for *Transport & Infrastructure – A 21st Century Transport & Infrastructure System*. The challenge set is to deal with an aging road and rail network in order to improve accessibility, trade activities, freight and safety. The solutions identified include:

- Reforms of the road Authorities and Departments
- Devolution of management of rural roads to the Counties
- Programme of upgrades to the major road network
- Strengthen trans-national corridors
- Improvements rail, marine, inland water and aviation transport

Specifically, in relation to roads, the Government will:

- Increase the paved network from the current 11,000km (7%) to 24,000 (15%) including 8,000km of LV roads, in five years using modern development instruments such as concessions, PPP, BOT and toll and maintenance arrangements
- Develop the necessary policies to ensure safety of all transportation systems with an emphasis on road safety
- Rehabilitate existing roads and open up new areas
- Upgrade unpaved road networks to make them accessible to motor vehicles.

Purpose of Report

To underpin Kenya's expected growth an efficient road and transport network is required for improved access to support all key sectors of the economy. The Government's programme requires a strategy involving upgrading of 8,000km to low volume sealed (light traffic) pavements and 5000 km to medium and heavy traffic pavements. It is anticipated that specifics on the strategy to deliver the 5000km of medium to heavy traffic pavements will be incorporated during a separate phase of the programme.

The purpose of the report is to draw attention to the exceptional nature of the plans, the level of mobilisation of Kenyan resources needed and the response needed to deliver such an ambitious programme. It is intended as a working document that can be used to focus attention of all key implementing authorities to be further developed into a robust plan.

PART A set out headline policy, targets and relevant plans for delivery of the agreed targets. A significant and sustained step change in historical levels of delivery will be necessary to achieve these goals.

PART B sets out a broad Research and Development programme that is required to support the delivery of the roads programme.

The role of research in delivery of the Programme

It is recognised that research is required both to **inform and develop policy** and also has a critical role in the development and efficient management of transport infrastructure. 'Transport research is required to inform not only policy formulation, but also in monitoring and evaluation of the various intervention strategies. It is therefore necessary to undertake research on the outcomes of the intervention strategies, the impact of transport on the economy and environment, transport safety and security, land use and transport, people attitudes and behaviour patterns in relation to transport, industry and transport, transport logistics, modernization of public transport amongst other issues. In Kenya, there is lack of a focal point to facilitate such research. In addition, there is need for dissemination of research findings to the relevant stakeholders' (INTP 2009).

Implementation will be greatly assisted by work historically carried out on road trials using new technologies and currently on development of design manuals. Trials on Low Volume Sealed Roads have been carried out in Kenya since the 1970's, funded by various Development Partners, including the UK's TRL Ltd with support from NORAD and DfID.

Major advances have been made through research in construction and maintenance of Low Volume gravel roads, which are costly to maintain and difficult to provide all-weather access. Adoption of Low Volume seals greatly reduces upgrading costs and also saves maintenance costs. These two savings release additional funding for increased lengths of construction.

Also, significant improvements in design will be made through preparation of a Manual for Low Volume Roads, funded by the EU.

Part B sets out a broad Research and Development programme that is required to support the delivery of the roads programme. It sets out priority and supporting themes and projects to be addressed by MTRD and initiates a process of dialogue and discussion with the other implementing agencies to address their R & D needs to support the roads programme. It is proposed to refine the themes and projects during the next phase of the project.

PART A: STRATEGY TO DELIVER MOTI POLICIES AND PLANS

The following sections set out headline policy, targets and relevant plans for delivery of the agreed targets. A significant and sustained step change in historical levels of delivery will be necessary to achieve these goals. Innovation, creativity, high levels of cooperation and new ways of working will all be required. The scale of the challenge is set out below and the changes needed for delivery. Options and associated onerous requirements are discussed and a way forward is identified.

It is recognised that the scale of the delivery is unprecedented in Africa although Kenya has undergone several accelerated roads programmes, the first being the Rural Access Road Programme (RARP) in the 1970's and 80's. There are examples internationally of exceptional road construction delivery and some of the factors for success can be assessed. Providing there are sufficient funds available for this programme, there are a number of options for going forward to create and sustain a paradigm shift of this magnitude and to set out a research programme to support its delivery.

A.1 DELIVERY OF PROGRAMME

This Report is intended to headline options and activities and examine some of the necessary components for delivery of the road upgrading programme in order to stimulate discussion and to assist in the decision making for the planning and implementation process. It is not intended to be definitive nor prescriptive. Through discussion and consultation, it is anticipated that the report would need to be followed by the production of a more detailed Programme Implementation Plan (PIP) in early 2014.

Policy and Targets - the rapid expansion and improvement of the road infrastructure to increase access and economic development. Targets are 25% reduction in construction and maintenance costs and delivery of 8000km LV roads, in 5 years.

The targets can be achievable if the following are adopted and implemented:

- New standards to eliminate over-design
- Adoption of LV sealed roads to reduce maintenance costs
- Improved construction quality and supervision to prolong road life
- Prompt maintenance interventions to reduce whole life costs.

These actions will produce **more for less**.

Strategic plan - delivery relies on a range of stakeholders including Authorities, Departments, Counties, consultants and contractors mobilising resources and activities in a very well-coordinated programme. That plan should define and action the following:

- Recognition of the scale of the challenge and associated paradigm shift needed in delivery
- Options and innovations
- Roadmap
- Map of delivery partners
- Definition of specific responsibilities
- Set out activities and timelines
- Methodology for management, coordination and delivery
- Secure budgets and funding
- Training and capacity building programme
- Education and dissemination
- Monitoring and evaluation

1.1 Scale of the challenge

The roads sector of Kenya has set a target to deliver 8,000km of upgraded LV roads to sealed standards within 5 years (6,000 rural roads and 2,000km national roads). It achieved less than 1,000km in the previous 5 years. The scale of the challenge is therefore exceptional and will require a paradigm shift in behaviors and delivery. New approaches will need to be agreed and delivered in a coordinated and unbureaucratic manner, with exceptional levels of management and coordination, across the whole of Kenya by a trained, competent, workforce with new skills, appropriately funded, supported by innovative technologies and underpinned by new standards, guidelines and Standard Forms of Contract.

The following summarises primary constraints to delivery of the new targets that must be addressed and overcome:

- Status Quo – the roads construction and management sector is fragmented. Previous targets for construction, management and maintenance have not been met and delivery has been constrained through cash flow, capacity, inefficiency and lack of support facilities. Current reforms are designed to address key weaknesses but will take time to implement and their effects will not be immediate.
- Reforms – the redistribution of responsibilities between the Road Authorities and the Counties will take time to take effect and, during the changes, momentum is lost at a time when acceleration is desired.
- Restructured road reserve corridors and poor physical planning in urban areas has created increased costs of construction, delays and bureaucracy.
- Knowledge and experience – The implementing agencies have not been sufficiently applying knowledge and technology that is available. Very significant changes in technologies and designs are taking place for sealing, upgrading and maintaining low volume and gravel roads. These changes come from improved understanding on infrastructure planning, design, construction, rehabilitation and maintenance.

- Delivery challenges –Capacity building will be required to the Counties and also a significant increase capacity is needed to achieve the step change in delivery. Although sufficient plant may be available, prioritization of deployment will be difficult. Additional material resources are needed and to be distributed in an efficient manner. Procurement and quality controls will have to become streamlined and administration improved.
- Institutional – the current institutional framework is undergoing changes required in the constitution and will need to be clarified/resolved as soon as possible.

1.2 Options and innovations

This type of step change in delivery of a road upgrading programme will require dedicated leadership, an agreed strategy for delivery, clear budgets and cash, fast-track approvals and exceptional communication. It also requires clear responsibilities, technical innovation, dedicated service providers and detailed, useful information. Change-oriented options and plans will require constant updating and a flexible approach will be needed to address new challenges.

In order to achieve a significant change in a delivery programme there will need to be a change in method of **management** and also a change in **delivery mechanisms**. The following examples illustrate several delivery and funding models:

1. United Kingdom Roads Programme

During the 1950's and 60's the UK Government embarked on a major Motorway and Trunk Road programme to address the increased need for travel and freight transport. It also wished to manage and maintain its entire network, including rural roads. The programme was **managed** by today's equivalent of:

- Department of Transport (DfT) – all modes of transport
- Highway Agency – Trunk road network
- Local Authorities – County Roads
- Devolved Administrations (Wales, Scotland and N Ireland)
- Transport for London
- Transport Research Laboratory.

TRL (Transport Research Laboratory, formerly TRRL) was established to carry out and **deliver** research and development for all the above programme needs. It established laboratories, research facilities, technical and research staff, publishing and training facilities and education and dissemination activities. Its purpose was to carry out R & D programmes to support policy development; programmes, plans and projects; testing; monitoring and evaluation; development and upgrading of Standards, design guides; and independent and impartial advice.

The UK Government historically established a comprehensive Transport Research Centre and a Highways Agency to deliver its trunk roads expansion programme which collaborated with Local Authorities responsible for development of the rest of the network. It applied its knowledge and experience to assist other governments in Europe and America and developed a support function to rapidly developing countries in Africa and Asia.

In Europe, TRL was instrumental in establishing a research hub called Forum for European Highway Research Laboratories (FEHRL) which is a vehicle for cooperative research across the 25 European Countries.

The rapid, economic and safe expansion of the road network could not have been achieved without the direct support of R & D from TRL. Once the major developments and innovations had been achieved the Government privatized TRL in 1996 through a tendering process. Throughout the process TRL peaked at about 3000 staff and is currently at about 300 staff.

International, national and local consultants and contractors now form Supply Chains to **deliver** construction and maintenance via Term Management Contracts. Innovation is expected through TRL and also the suppliers and selection criteria are based predominantly on technical competency and innovation - the roads programme is paid through fuel levies and taxes. A small but growing proportion comes from tolls.

2. India Roads Programme

India manages its roads programme through:

- Ministry of Road Transport & Highways(MORTH)
- National Highways Authority of India(NHAI)
- Ministry of Rural Development(NORD)

The Indian rapid roads expansion programme of National Trunk Roads is being funded through NHAI using long term road concessions and PPP, driven through ad-hoc consortia, funded through Development loans and repaid by Road User Charging. Roads Authorities were overhauled to deploy the programme and international experts were recruited. Innovation is expected from Private Sector.

Historically, CRRRI CSIR (Central Road Research Institute), India's national laboratory, established in 1952, a constituent of Council of Scientific and Industrial Research (CSIR). CRRRI provides technical support to the Road Authorities and testing, standards and training. It is engaged in carrying out research and development projects on design, construction and maintenance of roads and runways, traffic and transportation planning of mega and medium cities, management of roads in different terrains, improvement of marginal materials, utilization of industrial waste in road construction, environmental pollution, road traffic safety and analysis & design, performance monitoring/evaluation, service life assessment and rehabilitation of highway & railway bridges.

The institute provides technical and consultancy services to various user organizations in India and abroad. It also carries out capacity building in the area of highway engineering. It organises National & International Training Programmes and continuing education courses to disseminate the R&D finding to the masses.

Major clients are:

- Ministry of Road Transport & Highways(MORTH)
- National Highways Authority of India(NHAI)

- Ministry of Rural Development(NORD)
- Public Works Departments of States and Union Territories
- Airport Authority of India
- Road Research Laboratories of State PWDs
- Private Consultants and Individuals

3. Gulf State of Qatar

The Qatari Government established an implementing Authority for its roads programme, Ashghal (Public Works Authority). Innovation and technical support has historically been from national Universities and Standards have been adopted from foreign countries, either British or American.

To support its massive roads programme which is needed for regional and Gulf economic expansion, gas and oil sector support and for its growing international sports programme it decided to import foreign expertise and technology. It established 5 year Term Framework Agreements with International Consultants and Contractors paid by oil and gas revenues, on a BOT model. Innovation is expected by the suppliers and is the primary evaluation criteria for selection. By the end of the 5 year Frameworks, the suppliers will train Ashghal staff and build sufficient capacity and skill for gulf nationals to take over management and maintenance of the network.

Kenya's Needs

Kenya's expansion programme need is similar to that of the UK but it does not have the financial or technical expertise readily deployable. The India models demonstrate how taxes and private sector participation can be deployed and the Qatar model demonstrates how expertise can be imported if sufficient funds are available. However, by looking at best local and international practice, recent innovations in road design and construction, and mechanisms for cost savings, it is possible to build desirable components into a successful Kenyan programme:

The following are considered key or essential components:

- **Management Delivery options:**

A special purpose management and delivery team will be required to help the PS to coordinate implementation by involved agencies. This could be along the lines of say the Roads 2000 programme, or a Task Force or procurement of a Programme Management Unit (PMU) Delivery Team following the Qatar model:

 - Task force with special powers and responsibilities using a continual improvement approach
 - Programme Management Unit Delivery Team with approved term contract suppliers using whole life cycle approaches
 - Logical Framework would be required to ensure delivery milestones were met and remedial actions set up in a timely manner.
- **Organisational Framework**
 - Use hub structure on a regional basis (up to 10 across Counties)
 - Establish demonstration hub and replicate
 - Set up demonstration projects within hub using force account with approved consultants/contractors/supervisors

- Break larger sections (up to 50km) sections up into 5km contracts to enable involvement of youth and women cooperatives.
- Establish support training and information support programme
- Replicate in different regions taking into account local needs

- Innovative delivery options
 - Framework contracts for prequalified suppliers
 - Term contracts for design, construction and maintenance
 - Assisted consortia established
 - Supply chains set up
 - Bottlenecks programme

- Technical innovation
 - Use International experience
 - Develop and maintain fast track Standards, guidelines and quality control
 - Produce Work Methods
 - Carry out trials on any proposed specification/technical departures
 - Trial marginal materials
 - Trial less costly designs
 - Research and Development support
 - Bottlenecks programme

- Knowledge generation and sharing
 - Data collection, outputs and outcomes defined
 - Trials, monitoring and evaluation undertaken
 - Training and Capacity building undertaken by KeRRA and KURA
 - Education and workshop forums by KIHBT, KeRRA and KURA.

1.3 Delivery Partners

The following represents the key Agencies and their respective functions:

- Roads Department (RD) – Coordination
- Treasury – Development funding and assistance with other funding sources
- Kenya Roads Board (KRB) – Maintenance funding
- MTRD – Research and Development (R&D)
- KeRRA – Planning, design and contract administration for construction and maintenance of national rural roads, technical assistance to counties.
- KenHA – Construction and maintenance of national roads
- KURA – Planning, design and contract administration for construction and maintenance of national urban roads, technical assistance to counties.
- Counties – Construction and maintenance of county roads
- KIHBT – Technical/staff capacity building
- MTD – Equipment and materials production

1.4 Specific responsibilities of partners for delivery

- RD – Planning and coordination of programme, inventories
- MTRD – Pavement design, axle load surveys, construction material inventory, construction control oversight, monitoring and evaluation
- Treasury – Road development funding and cash flow
- KRB – Road maintenance funding and cash flow
- MTD – Supply of crushing plants, cutback bitumen emulsions at county levels, stone aggregate, manufactured gravel and concrete products
- KeNHA – Design and implementation, education and dissemination
- KeRRA – Design and implementation of rural county roads, education and dissemination
- KURA – Design and implementation of LV urban roads, education and dissemination
- KIHBT – Training of foremen, plant operators, supervisors, inspectors and technologists
- Counties – Implementation of County Roads

1.5 Management, coordination and delivery

The following is a list of components that could be incorporated into the delivery plan:

- Innovation plan and step change requirements
- Performance requirements
- Programme Management support to RD
- Term contracts
- New Forms of Contract adopted
 - Public – Private Partnership model
 - Performance - based Contract model
 - Model Contract Documents, including MoM, BoQ for FIDIC ‘Method’
- Management systems in place
 - Road Maintenance Management System [RMMS] Development
 - Road Management System [RMS] Development
 - Structures Surveys and Databases
- LV Roads delivery Forum
- Research Forum and National/Regional Innovation funds
- Authorisation requirements (eg recruitment)
- Continual Improvement

1.6 Budgets and Funding

It is anticipated that funding for the 8,000km LV roads upgrading programme using innovative approaches would be substantially less than that required if conventional approaches were applied and would be by a mix of contributions from Government, KRB and Development Partners.

- The key components for indicative 5-year budgeting purposes are:
 - Design, construction and supervision: Ksh 240 billion (based on unit cost of **Kshs 30M/km @8,000km**), i.e. 48 billion per year

- Policy formulation and Coordination and Performance Monitoring Kshs 12 billion (based on 5% of construction and supervision costs) i.e. 2.4 billion per year
- Training cost Kshs 4.8 billion (based on 2 % of construction and supervision costs) i.e. 960 million per year.
- Supporting research programmes Ksh 2.4 billion (based on 1% of construction and supervision costs) i.e. 480 million per year.
- **TOTAL of above is approximately Kshs 259.2 billion (51.88 billion per year)**
- **Traditional costs of a similar upgrading programme using conventional road designs would be of the order of Ksh 480 billion** (based on **current cost of Ksh60M/km**), thereby achieving 46% reduction in costs.
- A number of funding mechanisms will need to be mobilized to fund the programme from:
 - MoF
 - RMLF
 - KFW
 - WB
 - DfID
 - AfDB
 - EU
 - AFCAP 2
 - Youth Fund
- An option for delivery could be to set up basket funding with Development Partners
- Another option would be to delineate specific programmes to each partner but managed by a Joint Development Forum.

1.7 Training and Capacity Building Programme

A long term and continual training and capacity building programme will need to be agreed, funded and implemented:

- Tailored training for 8000km delivery
- Set out staffing and training requirements for each partner
- Set out staffing and training requirements for Counties
- Education and dissemination
- MTRD requirements
 - Materials Engineers (on the job)
 - Laboratory technicians
 - Researchers
 - Designers/reviewers
- KIBHT
 - Train-the-trainer
 - Foremen
 - Inspectors/Supervisors
 - Plant operators
 - Professional engineers

- Counties
 - Supervisors
 - Project Managers
 - Technologists/technicians

1.8 Monitoring and Evaluation

In order to determine the effectiveness of the plans and programmes, it will be necessary to perform monitoring and evaluation activities. This will inform continual improvement requirements and aid forward planning. The project management cycle should comprise:

- Data collection and refinement
- Modelling
- Performance and Reporting
- Review
- Interventions

Implementers:

- Agreeing and monitoring targets/KPI's
- Targets equate to 43km upgraded roads per year per County
- Interfaces, 6000km KeRRA, 2000km KeNHA

2. STRATEGIC OBJECTIVES AND ACTIVITES FOR THE UPGRADING OF 8,000 KM PAVED STANDARDS IN FIVE YEARS

2.1 Review of Institutional Framework for Management of the Road Network and the Road Sub-Sector

The expansion of the paved road network from the current 11,000 km (7 %) to 24,000 km (15%) in five (5) years as set out in the Jubilee Manifesto for the transformation of Kenya is an onerous undertaking which, to achieve, will require paradigm shifts in the management of the road sector guided by:

- (i) the national values and principles of governance set out by Article 10 of the Constitution;
- (ii) the values and principles of public service set out by Article 232 of the Constitution;
- (iii) the principles of leadership and integrity set out in Chapter Six of the Constitution; and
- (iv) the principles of intergovernmental relations as envisaged in the Intergovernmental Relations Act, 2012.

Urgent review of the institutional framework is underway to give effect to the Fourth Schedule of the Constitution of Kenya, 2010. According to the Fourth Schedule the functions of the National and the county governments with respect to roads are as follows:

- National Government:

- (a) Road Traffic;
- (b) The construction and operation of national trunk roads; and,
- (c) Standards for the construction and maintenance of other roads by counties.
- County Governments:
 - (a) County roads;
 - (b) Street lighting;
 - (c) Traffic and parking; and,
 - (d) Public road transport.

The Fourth Schedule does not however provide for the definitions of national trunk roads and county roads. However, pending the enactment of a statute by Parliament providing for explicit definitions, it is assumed that national trunk roads are those currently under the jurisdiction of the KeNHA and county roads those currently under the jurisdiction of KURA and KeRRA in accordance with the First Schedule of the Kenya Roads Act, 2007.

To achieve efficient and effective management of the network and the expansion of the paved road network by 8,000 km review, consolidation and rationalization of legal and institutional frame work of the road sub-sector agencies is required to provide for appropriate mandates. The network split between National and County roads must first be carried out and once this is done the institutional framework can be finalized and gazette. Institutions functions may include:

i. MOTI - Roads Division

- Advise the government on all matters of policy relating to public roads
- Oversee effective coordination of policy implementation
- Determine the provisions to be made for capital and recurrent expenditure
- Ensure that:
 - All agencies have management structures and systems for monitoring management performance against plans and targets and that corrective action is taken when necessary
 - appropriate strategic plans and annual programmes are in place
 - appropriate systems and practices are established for management, financial planning and control
 - monitoring targets are set.

ii. Materials Testing and Research Division/Agency

- Research on roads construction materials, methods and delivery options, and on traffic management and road safety.
- Development and review of design and construction standards, and standard forms of contracts and quality control systems.
- Pavement inventory and performance monitoring
- Materials testing services
- Inventory of construction material sources Focus should be on locally available materials and their characteristics/properties rather than on those that meet existing conventional specs that tend to exclude materials that have performed well on LVSRs

iii. Mechanical and Transport Department (MTD)

- Transport and plant & equipment hire services.

- Production and provision of basic construction materials on commercial basis: crushed stone aggregates and chippings, concrete products (i.e. culverts, IBD, kerbs, channels, etc, bitumen binders and bituminous mixes and blended gravel for gravel pavements and gravel wearing courses).
- iv. Engineers Board of Kenya**
 - Coordinate internship of graduate engineers
 - Registration and licensing of engineers
 - Registration and licensing of engineering consulting firms
 - Ensure that professional engineering services are provided by qualified engineers.
- v. Kenya Institute of Highway and Building Technology**
 - Provide training programmes to build human resource capacity for infrastructure development and maintenance.
 - Develop policy on technical training and capacity building
 - Provide capacity building and technical training needs assessment
- vi. National Construction Authority**
 - Promote and stimulate the development, improvement and expansion of the construction industry
 - Registration and accreditation of contractors
 - Accredite and certify skilled construction workers and supervisors
- vii. Kenya Rural Roads Authority (KeRRA)**
 - Development, maintenance and administration of national rural roads
 - Monitoring of standards of rural road construction as set by the MoTI
 - Technical Support to County Governments on:
 - Project design, documentation, and management including contract administration
 - Procurement of consultancy services for feasibility studies, design and project supervision
 - Procurement of works
 - Maintenance standards and management systems
- viii. Kenya National Highways Authority (KeNHA)**
 - Development, maintenance and administration of national trunk roads
- ix. Kenya Urban Roads Authority**
 - Development, maintenance and administration of national urban roads
 - Monitoring of standards of urban road construction as set by the MoTI
 - Urban transport planning and development of transport models to reduce transit time and enhance safety
 - Development and administration of special purpose vehicles for expansion and maintenance of urban infrastructure through public private partnerships
- x. County Governments**
 - Development, maintenance and administration of county roads

- Tap into the current KeRRA technical capacity in the counties to provide the requisite support

2.2 Proposed Strategies

The following tables sets out proposed primary objectives, with associated strategies and activities, for each of the key implementing agencies. Through dialogue, discussion and agreement, it is planned to firm up on these tables, including development of performance indicators and target by Plan Years.

Draft Strategy for Upgrading of 8,000 Km of Unpaved Roads to Low Volume Sealed Standards in 2013 – 2017 Plan Period

1 Principal Secretary /Infrastructure Secretary

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
Improve efficiency and effectiveness of road sector institutions and increase capacity to enable expansion of the paved road network from the current 11,000 km (7%) to 24,000 km (15%) in five(5) years	Review, consolidate, and rationalize the legal and institutional framework for effective and efficient management of the road network and to align functions with the provisions of constitution of Kenya, 2010	Prepare sessional paper							
		Public/Stakeholder Consultations							
		Review of relevant statutes and develop a draft bill							
		Seek Cabinet Approval							
		Submission of draft Bill to Parliament							
Explore sources of additional financing required for expansion of the network	Involve public and private sector in financing infrastructure development and maintenance	Review paper on best practice for PPP							
		Invite proposals							
	Increase development allocation from fiscus								
	Seek additional support from development partners	Set up joint Funding Forum							
Establish means of delivering step change	Procure Programme Management Unit (PMU)	TOR and RFP							
Government oversight of programme	Establish Task Force (TF)	TOR and mandate							
Programme implementation plan (PIP)	Joint implementation via PMU and TF	Prepare and approve PIP							
Faster procurement	Deploy contractors through new term contracts and area contracts	Produce procurement plan							
Establish supporting research programme	Produce joint strategic research plan	Organise Workshop							

Draft Strategy for Upgrading of 8,000 Km of Unpaved Roads to Low Volume Sealed Standards in 2013 – 2017 Plan Period

2 Materials Testing and Research Division (MTRD)

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
Research on roads construction materials, methods and delivery options, to reduce overall infrastructure development and maintenance costs by 25% in the next five years	Develop research policy and strategy to support expansion of the paved road network and scope out research projects	Develop strategy for upgrading of 8000 km to low volume sealed standard	Report						
		Develop strategy for building of research capacity	Report						
	Research on construction materials, methods and delivery options to prolong pavement life and reduce to development and maintenance costs	Research on construction materials							
		research on low volume sealed roads							
		Develop pavement design guidelines and manuals to support upgrading of 8000 km to low volume sealed roads standards							
		Dissemination of research findings							
		Build research data bank							
	Facilitate quality assurance and enforcement of value for money in design and construction of roads	Development and review of design manual and standards construction specifications							
		Review standard forms of contracts and quality control systems							
		Vet feasibility studies and designs							
		Establish well equipped testing laboratories in the counties							
	Reduce costs of project design	Mapping of gravel and hard stone sources							
		Profiling of alignment soils along unpaved road corridors							
		Traffic and axle load surveys							
	Build research and capacity to enable effective and efficient support to national agencies and county governments	Transform MTRD to a SAGA							
		Expand and upgrade materials testing facilities							
		Expand and upgrade ICT systems							
		Develop and install pavement management systems and research database							

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3 Mechanical and Transport Division (MTD)

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
Provide transport plant and equipment hire services and basic construction materials on commercial basis to reduce overall infrastructure development and maintenance costs by 25% in the next five years	Provide transport and plant & equipment hire services at Counties to reduce the cost of road maintenance and upgrading unpaved roads to low volume sealed standards	Provide vehicle hire services for supervision and administration to executing agencies at national and county levels							
		Provide trucks for transportation of goods and construction plant and equipment hire services at at national and county levels							
	Improve plant and equipment stock and maintenance specifically for LV sealed roads	Audit and set out procurement needs							
	Cooperate with plant operator training and distribution of equipment and plan	Collaborative plans							
	Provide basic construction materials on commercial basis to reduce cost of road maintenance and upgrading unpaved roads to low volume sealed standards	Install plants and provide stone aggregates, bitumen binders, bituminous mixes and blended gravel at Counties							
		Install plants for the manufacture of the following concrete products at county level: concrete culverts, IBD, kerbs and channels							
Use available materials more effectively	Coordinate national material inventory with local supply needs	Work with MTRD							
Improve marginal materials	Provide processing facilities to recover , recycle, and upgrade materials	Work with MTRD							

4 Engineers Board of Kenya

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
To enhance professional capacity for the expansion of the infrastructure	Introduce compulsory structured three year practical training (internship) programme for all Kenyan engineering graduates to enable timely achievement of professional and technical qualifications	Investigate international practice							
		Establish and implement acceleration programme							
	Fast track registration and licensing of engineering consulting firms	Create tender benefits for registered firms							
Ensure that professional engineering services are provided by qualified engineers	Require all intermediate and senior staff are qualified								
To educate and disseminate relevant information for capacity building	To produce engineering proceedings and case studies to address innovation and technology development	Establish programme of lectures, case studies and publications							
To participate in an Engineering Academy	Confer Fellowships for achievement	Establish fellowship							
To participate more at county levels	Strengthen regional presence	Decentralise							

5 Kenya Institute of Highway and Building Technology

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
Provide training programmes to build technical human resource capacity for infrastructure development and maintenance.	Institutional transformation to provide technical training and competencies in project management, procurement (works, services and goods) and contract administration at management level and in construction and maintenance technology at supervisors and artisan levels	Establish needs assessment criteria							
		Prioritise training programmes across all key disciplines							
	Develop policy on training, technical human resource capacity building for the road sub-sector								
	Provide capacity building and technical training based on needs assessment to the road sub-sector institutions								
Design specific courses and training to support upgrading of LV roads to sealed standards	Use facilities at all three campuses at Ngong, Nairobi and Kisii using in-house and external trainers for capacity building	Establish new training programmes							
Step change training and development	Use 'train the trainer' approach	Involve international experts							
Accelerate training programme	Establish training network with other partners such as Nairobi University, Technical University of Mombas	Set up cooperative forum							

6 National Construction Authority

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
Promote and stimulate the development, improvement and expansion of the construction industry	Accelerated registration and licencing of contractors: 1. National 2. Regional 3. International	Set up central coordination programme							
		Establish fasttrack for counties							
Improve capacity of contractors well placed to deliver LV sealed roads	Categorize and approve contractors according to value of work ,capability and according to whether Specialist foundation Contractors, Roads or other Civil Works Contractors.								
Specific approval for LV roads using labour-based techniques	Registration and accreditation: 1. Construction 2. Maintenance	Training on LV construction and maintenance techniques							
Improve capacity of local SME's	Facilitate establishment of consortia and JV's								
Bring international best practice	Facilitate cooperative agreements, subcontract arrangements, JV's								
Increase transparency and reduce corruption	Improve tendering transparency by working with government in establishing review panel specifically for LV Roads								
Improved contractor capacity	Capacity building through training, financial assistance, and sourcing assignments for member contractors.								
Competent and skilled workforce	Accredit and certify skilled construction workers and supervisors								

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7 Kenya Rural Roads Authority (KeRRA)

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
Provide technical support to County Governments on design, construction and maintenance of rural roads	Technical support in project design , documentation and management including fasttrack procurement of contracts for consultancy services and construction works								
	Streamline quality procedures in accordance with such standards as may be defined by the National Government								
	Fasttrack collecting and collating data that may be necessary for efficient forward planning								
	Ensuring enforcement of policies on rural roads set by the National Government								
	Establish priority supporting research programme								
Disseminate research findings and policy guidelines by National government									

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8 Kenya Urban Roads Authority

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
Urban transport planning and development of transport models to reduce transit time and enhance safety	Development and administration of special purpose vehicles for expansion and maintenance of urban infrastructure through public private partnerships								
Improved Public Transport	Use of Bus Rapid Transit (BRT), bus lanes, light rail, commuter rail, integrated transport								
Reduced Congestion	Use of ITS, tolling, congestion charging, park and ride								
Introduce innovation and latest technology	Establish priority supporting research programme								
Build capacity	Disseminate research findings and policy guidelines by National government								

Draft Strategy for Upgrading of 8,000 Km of Unpaved Roads to Low Volume Sealed Standards in 2013 – 2017 Plan Period

9 Kenya National Highways Authority (KeNHA)

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
Upgrading t of 6000 Km of unpaved trunk roads to bitumen standards in the next five years	Upgrading 2000 Km to low volume sealed standards								
	Upgrading 4000 Km of heavily trafficked roads to high volume standard								
Establish improved procurement procedures	Use of BOT, DBFO, Design and build, Consortia, Term Maintenance, Approved Supplier								
Develop improved contract practices	Management contracts,, Framework agreements, Call-off Contracts, Joint Venture, PPP								
Introduce innovation and latest technology	Establish priority supporting research programme								
Build capacity	Disseminate research findings and policy guidelines by National government								

Draft Strategy for Upgrading of 8,000 Km of Unpaved Roads to Low Volume Sealed Standards in 2013 – 2017 Plan Period

10 County Governments

Objective	Strategy	Activity	Performance Indicator	Target by Plan Year					Total Plan Target
				1	2	3	4	5	
Upgrading of 7000 Km of unpaved trunk roads to bitumen standards in the next five years	Upgrading 6000 Km to low volume sealed standards	Work collaboratively with other Counties							
		Participate in Task Force							
		Work collaboratively with KeRRA							
	Upgrading 1000 Km of urban roads to paved standards	Work Collaboratively with KURA							
	Establish regional hubs of Counties	Use first as a demonstration project							
	Establish collaborative arrangements on a regional basis	Set up 'clusters' within geographical regions							
	Fast track training programme of Supervisors	Mobilise all training institutes for tailored programme							
	Develop recruitment strategy	Implement recruitment programme, including contract hires.							
	New and improved contract arrangements								
	Share best practice	Term Contracts							
		Approved suppliers							
		Consortia/JV's							

3 PROPOSED TOR FOR THE PROGRAMME MANAGEMENT UNIT

The Programme Management Unit (PMU) would be made up of selected individuals under the leadership of a Team Leader, mandated to coordinate activities to deliver the programme and accountable for progress.

Task: deliver 8,000km in 5yrs at 25% reduction in whole-life cost:

- Established by PS, reporting to Roads Secretary
- Mandated to coordinate the implementation and delivery of 13,000km of upgraded roads, including 8,000km upgraded LV roads
- Interfacing with Implementing Agencies Management Steering Group (MSG - representatives of current agencies initially and County Government)
- Establish Project Plan, logical framework, budget and cost management, progress and performance, monitoring and evaluation and continual improvement
- Use of international best practice, innovation and creativity, appropriate cutting-edge technology and new ways of working

4 ROADMAP AND WAY FORWARD

ESSENTIAL ELEMENTS FOR SUCCESS

- **Agreed 8,000km Strategy and Plan for Upgrading Roads**
- **Establishment of Programme Management Unit (PMU)**
- Use of surface seals technology and international African experience for upgrading LV roads
- Development of road design manual specifically for low volume roads, endorsed and agreed as national manual, with a cadre of trained design professionals, supported by specifications and construction guidelines
- By-in, involvement, training and capacity building at County level
- Involvement of all implementing agencies and other stakeholders
- Cooperation and support from all funders and Development Partners

Having recognized the shift needed to achieve a significant change in a delivery programme, including the need for a change in method of management and also a change in delivery mechanisms, a model and roadmap could be agreed with all stakeholders to set out the way forward, including milestones and deliverables. A methodology for appraisal, evaluation and continual improvement would be agreed.

IMPLEMENTATION MATRIX

Establish Roads Programme Management Unit reporting to Roads Secretary and establish agreed strategy for:

- Options and innovations
- Roadmap
- Map of delivery partners
- Definition of specific responsibilities
- Set out activities and timelines
- Methodology for management, coordination and delivery
- Secure budgets and funding
- Training and capacity building programme
- Education and dissemination
- Monitoring and evaluation

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ROADMAP OF WAY FORWARD

1. PS to distribute Draft strategy for 8,000km upgrading report for consultation
2. All implementing agencies to prepare for Workshop and their presentations.
3. Workshop meeting in early 2014 for discussion
4. Finalise 8,000km strategy, agree actions and implementation plan
5. Set up PMU
6. Initiate implementation matrix, including management and delivery mechanisms and specifics on following:
 - Delivery Partners
 - Specific responsibilities of partners for delivery
 - Management, coordination and delivery
 - Budgets and Funding
 - Training and Capacity Building Programme
 - Monitoring and Evaluation

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PART B: DRAFT RESEARCH POLICY FOR UPGRADING RURAL ROADS

PART B sets out a broad Research and Development programme that is required to support the delivery of the roads programme. It summarises relevant activities to achieve the objectives, indicators and targets under the Ministry's Theme relating to Research and Development. The activities relate to upgrading of 6,000km of County Roads and 7,000km of National Roads to bitumen standards, specifically focussing on 8,000km upgraded LV roads

The newly formed MoTI agreed future transport strategic themes and KPI's at a Retreat held at Naivasha from 17th to 20th July 2013. The following table sets out the four strategic themes and KPI's covering transport efficiency, Research and Development, enforcement and capacity mobilisation. It is followed by a summary table of proposed activities to achieve the objectives and indicators under the Ministry's Theme relating to Research and Development. It also identifies targets and provisional budget requirements to achieve those targets.

Relevant strategic themes and KPI's comprise:

A. Develop and manage transport infrastructure to facilitate efficient movement of goods and people whilst ensuring environmental sustainability

1. Increase paved road network from 7 to 15% and maintain the road network from present coverage of 40% to 60%.
2. Reduce overall transit time in urban centres by 30%.
3. Develop and implement an integrated information system for transport and infrastructure services.

B. Research and development for an efficient transportation system

1. Research on construction materials and methods with a view to reduce overall infrastructure development costs by 25% in the next 5 years
2. Undertake operational research to identify opportunities to reduce operational costs in the Northern corridor by 25%
3. Undertake research on transport to enhance safety to reduce overall carnage by 50%
4. Carry out research to identify the most efficient financing and implementation of structures to reduce finance costs by 25%

C. Develop and enforce regulations and standards for safe, secure and efficient transport systems

1. Improve safety and security occurrence of transport systems by 50%

D. Mobilise resources and capacity building

1. Increase number of professional skilled persons to 40,000
2. Increase number of trained local contractors to 9000

The following table summarises relevant activities to achieve the objectives, indicators and targets under the Ministry’s Theme relating to Research and Development. The activities relate to upgrading of 6,000km of County Roads and 7,000km of National Roads to bitumen standards. This report relates only to the LV roads component and amounts to 8,000km in total across all Authorities, to be delivered over 5 years (identified by green shading). The development of research policy is set out in a separate report ‘Draft Research Policy for upgrading rural roads’(November 2013).

THEME B: UNDERTAKE RESEARCH AND DEVELOPMENT FOR AN EFFICIENT TRANSPORT SYSTEM

	Objective	Performance Indicator	Target	Proposed Activities
3.1	To research on construction materials, methods and delivery options to reduce overall infrastructure development and maintenance costs by 25% in the next 5 years	Percentage reduction in overall infrastructure development and maintenance costs	25%	<p>Development of research policy to support upgrading of 8,000 km of classified roads in counties to bitumen standards in the next 5 years</p> <p>Finalization of research on Low volume sealed roads and construction of road trials</p> <p>Mapping of natural construction material sources</p> <p>Profiling of subgrade soils along unpaved classified road corridors</p> <p>Research on pavement materials for heavy traffic loading</p> <p>Development and review of manuals and quality control systems</p> <p>Research on technology and systems for road maintenance management optimisation</p>

B.1 MTRD RESEARCH OBJECTIVES, TARGETS AND ACTIVITIES

This section sets out MTRD’s proposed research objective and associated activities to deliver MOTI targets. These proposals have been developed through extensive dialogue and discussion with all the Departments, Implementing Agencies, Counties and their agents/consultants and contractors. It is not exhaustive and will be continually updated and augmented by proposals and requirement from all stakeholders. It will also be affected by availability of funds and available budgets. Through a process of consultation, the projects will be prioritized so that maximum value and usefulness to Government targets can be achieved.

Section B.2 identifies **general** priorities for research put forward by other Authorities and Departments identified through the current AFCAP and EU TA support programmes to MOTI.

The following table gives a summary breakdown of current proposed activities followed by suggestions of proposed research projects.

MOTI OBJECTIVE 3.1: To research on construction materials, methods and delivery options to reduce overall infrastructure development and maintenance costs by 25% in the next 5 years

ASSOCIATED ACTIVITIES
Development of MTRD research programme to support upgrading of 8,000 km of classified roads in counties to bitumen standards in the next 5 years
Finalization of current research on low volume sealed roads and construction of road trials
Mapping of natural construction material sources
Profiling of subgrade soils along unpaved classified road corridors
Maintenance planning and implementation
Development and review of manuals and quality control systems

1 Development of research programme to support upgrading of 8,000 km of classified roads in counties to bitumen standards in the next 5 years

PROPOSED ACTIVITIES

- **Research and benchmark current infrastructure costs for upgrading and rehabilitation of LV roads**
- **Through Stakeholder consultation, identify methodology to reduce capital cost, time of delivery and life cycle costs and set up development programme of actions**
- **Carry out gap analysis of current capabilities/capacity and those necessary to deliver upgrading programme**
- **Documentation and appraisal of current national and international research practise and documents relevant to upgrading programme**
- **Establishment of a policy development, monitoring and evaluation facility**

PROJECTS

- **Improved Pavement Designs, Construction and Maintenance**
A programme of updated pavement design guidelines and related documents is needed for construction and maintenance.
- **Standards, Guides and Manuals**
A programme of production of Standards, guides and manuals is required to be produced and programmed. This will be informed by a parallel EU TA programme which is currently supporting MTRD on the following:
 - Review of Design Manuals
 - Low volume seals pavement design manuals
 - Urban design guidelines
 - Economic appraisal

➤ Research database

- **Road Maintenance Management System (RMMS) development**

The RMMS will require systematic regular data collection on the road network's pavement condition, traffic, extent, location etc. It will also require a computerised pavement management system (e.g. based on HDM-4) that allows analysis several years ahead. Such a system will be used by MOTI, MTRD, KRB and Authorities each drawing information from it to aid its decisions and feeding back into it

- **Databases** To develop more comprehensive and representative data and to collaborate with MTRD on its collection, maintenance, modelling and evaluation.

- **Modelling** (including data and management systems and design guides)

- **Establish Material Testing Programme for Counties**

Currently, there are 11 No regional laboratories. There is a need to increase this (upto 47) to provide testing services to the Counties. A regionalisation strategy will need to be developed and agreed with the Counties, Implementing Authorities and donor-funded projects and a long term plan to recruit, train and develop staff and procure/ commission/maintain testing equipment.

- **Non-motorised intermediate means of transport.** Guidelines for integration and access.

- **Contractor support and advice through information, education and dissemination.** A training and capacity building programme is needed.

- **Climate change resilience and adaptation strategies.** Kenya's road infrastructure is vulnerable to flooding, erosion, landslips and other associated phenomena. Risk assessment and mitigation strategies are commonplace internationally and should be studied for relevance and prioritisation for Kenya. Typical activities comprise:

- Education and awareness training
- Vulnerability assessment of critical infrastructure
- Risk Assessment and Mitigation
- Emergency Response

- **Road Safety**

National Transport and Safety Authority (NTSA) has been recently set up and will need to work closely with MTRD, all RAs and any other agencies whose mandate includes the improvement of road safety.

- **Training and capacity building**

Carry out training needs analysis with prioritised training programme.

2 Finalization of research on low volume sealed roads and construction of road trials
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PROPOSED ACTIVITIES

- **Develop terms of reference for procurement of short term consultancy services for the development of design guidelines for low volume sealed roads (DGLVSR)**

Pavement Design Guidelines for LV Sealed Roads are currently being undertaken using an MTRD document Ref: M.1970/35/R/6 Vol 1, dated 21st June 2013. These are based on information contained within Road Design Manual Part III. They require augmentation and refinement before review and final implementation as a published document.

Guidelines for design of low volume sealed roads need to be produced as a matter of urgency. An inventory of previous studies is to be developed and reviewed against current MTRD guidelines and a definitive document to be scoped and developed through TOR produced and implemented by the EU.

- **Design and implement education and dissemination programme for DGLVSR**
- **Develop/update support documents for DGLVSR**
- **Monitor and evaluate trials on LVSR and incorporate as appendices to DGLVSR**

3 Mapping of natural construction material sources

PROPOSED ACTIVITIES

- **Materials Database & National Inventory**

A National data base of materials for construction and products is needed to support the Governments road construction and maintenance programme. MRTD has initiated 3 projects and this should be followed by a prioritised national roll-out programme.

- **Needs assessment for use of marginal materials, mining, quarry and other wastes**
Needs assessment to be followed by research programme into behaviour and improvement projects.

4 Profiling of subgrade soils along unpaved classified road corridors

PROPOSED ACTIVITIES

- **Use of rapid methods for profiling and classifying subgrade materials for road corridors**

5 Research on pavement materials for heavy traffic loading

PROPOSED ACTIVITIES

- **Review current pavement design manual and update to cover for high volume roads**
- **Develop and implement axle load management regulations**

6 Maintenance planning and implementation

PROPOSED ACTIVITIES

- Prepare and undertake a comprehensive rural road assets and condition survey
- Establish a comprehensive traffic data base
- Develop and implement axle load management regulations
- Data collection, modelling and maintenance planning
- Review and update routine road maintenance
- Review and update periodic maintenance
- Update bridge, structures and drainage maintenance
- Research low cost seals for periodic maintenance
- Research cold mix asphalt for periodic maintenance and design

7 Development and review of manuals and quality control systems

PROPOSED ACTIVITIES

- **Quality Controls**
A programme of quality Control documents and procedures is needed to provide consistency and uniformity of design, construction and maintenance. Associated requirements for MRTD to develop include:
 - certification
 - verification
 - accreditation
 - Construction Quality Monitoring and Measurement
 - Quality Assurance, ISO 9001
 - Performance Monitoring and Indicator Development
- **Bridge design and upgrading**
- **Manuals and guides for periodic maintenance**

8 Training and Capacity Building

PROPOSED ACTIVITIES

- **Training** will be a combination of courses, workshops and mentoring. A budgeting and programming plan will need to be devised and implemented.
- **Labour-Based Technologies** To pioneer and to optimise improvements in labour-based technologies using international best practice approaches.

B.2 RESEARCH ACTIVITIES NEEDED BY IMPLEMENTING AGENCIES

This Section will be developed with the implementing agencies, through discussion and meetings through to February 2014, when a workshop is planned to formalize a supporting research programme. General priorities for research have been put forward by Authorities and Departments through the current AFCAP and EU TA support programmes to MOTI.

**Draft Strategy for Upgrading of 8,000 Km of Unpaved Roads to Low
Volume Sealed Standards in 2013 – 2017 Plan Period**

Consultations reported in the AFCAP LV Roads Research Report (March 2103) and the EU ICBTRS Inception Report (May 2013) give a consistent set of R & D needs across all Departments, Boards, Authorities and other relevant stakeholders. For the most part, needs are aligned with current and emerging policies and priorities for MOTI.

Priorities areas for research put forward by implementing agencies include:

- **Low Cost Seals for LV Roads and for Periodic Maintenance**
- **DCP Pavement Design Manual - Implementation activities**
- **Cold Mix Periodic Maintenance Research and Design Actions**
- **Labour-Based Technologies**
- **Databases**
- **Materials Databases**
- **Road Asset Management System**
- **Assess need for Climate Change Adaptation Strategies**
- **Asset Management**
- **Road Contract options**
- **Contract Procurement, Management and Costing**
- **Quality monitoring and Control**
- **Urban Network Planning**
- **Urban Road Design and Environmental Guidelines**
- **Traffic Management and Signalisation**
- **Road Safety**