



Preparatory Activities for Transformation of the MTRD into a Transport Research Centre / Development of Concept Models and Strategy for a Transport Research Centre

PART D

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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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1. INTRODUCTION

The Materials Testing and Research Department (MTRD), of the newly-formed Transport and Infrastructure Ministry, is developing a framework for their **transformation to a Transport Research Centre**; and priority activities based on their mandate and their Strategic Plan (AFCAP Report on Development of Low Volume Roads Research Capacity in Kenya, March 2013), prepared under AFCAP/KEN/089G activities. This project is **an extension** to that work and is referred to as PHASE 1. It is funded by the Africa Community Access Programme (AFCAP) a research programme underpinned by the UK government's Department for International Development (DFID).

1.1 Background and objective

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. 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.

The Kenyan Government Coalition's Manifesto for Transforming Kenya (2013 – 2017) sets out an 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. Increase the paved network from the current 11,000km (7%) to 24,000 (15%) including 8,000km of LV roads, in five years
- Strengthen trans-national corridors
- Improvements to rail, marine, inland water and aviation transport

Under current reforms, it is proposed to establish a **National Transport Research Institute** which would support the following modes:-

- Road transport
- Rail transport
- Maritime and inland water transport
- Air transport, and
- Non-Motorised and Intermediate Means of Transport (NMIMTs).

In addition to developing research strategies to address requirements of the Manifesto, MTRD will address strategies in support of the Integrated National Transport Policy (2009). *'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).

MTRD intends to strengthen its core skills and research delivery and to evolve into a transport institute that will be recognized internationally as a centre of excellence. The long term outcomes of implementation of research findings is expected to **deliver more durable roads and transport, lower transport operating costs, shorter travel times, lower accident and fatality levels, improved designs and standards for construction and maintenance, and more efficient and cost effective operations.**

Report Objective

To assist MOTI in their preparations for transformation of MTRD to a national transport research institute in order to build sustainable research capacity.

2. APPROACH AND METHODOLOGY

2.1 Approach

The approach of this Technical Assistance programme is to bring specific experience from other national research institutes to inform the process and to determine appropriate models to implement the strategic plans for transformation into a transport research centre of excellence over the next 5 to 10 years.

2.2 Methodology and Scope

The main theme is the Development of Concept Model and Strategy for Transport Research Centre and comprises the following activities:

ID	RESULT AREA / ACTIVITY
	Development of Concept Model and Strategy for Transformation to a Transport Research Centre
1	Arrange overseas benchmark visits Arrange study tours to Australia and UK research institutes to look at institutional setting, technologies, programmes and delivery of research Also, to understand how they operate, their funding arrangements and technologies. The aims are to help inform establishment (and development) and also to develop long term assistance arrangements.
2	Assist MTRD develop long term vision and mission The plans will look forward 10 to 20 years and might encompass regional/international aims, as well as broadening the remit to transport and safety.

3	<p>Assist MTRD explore scope and model options with MoTI MTRD will need to communicate proposed plans set up under Section 1 above with the PS and with MoTI and modify as necessary to gain approvals.</p>
4	<p>Develop institutional setting options within MoTI Institutional changes are taking place and will continue for the foreseeable future. Plans must be sufficiently flexible and adaptable to cover all future known options.</p>
5	<p>Set out timelines, programmes and roadmap An overall programme and roadmap will need to be developed, including milestones and key decision points.</p>
6	<p>Stakeholder Workshop Organise a stakeholder workshop to present and discuss the Draft Concept Models and Strategy Report for the Transport Research Centre.</p>

3 LONG TERM VISION AND MISSION

3.1 Context

Kenya Vision 2030 sets out the country’s aims to become a newly industrialised country providing a high quality life for all citizens. The country’s GDP is expected to grow at an annual rate of 7 to 10%. To underpin this growth an efficient transport network is required for improved access to support the key sectors of the economy. The Ministry of Transport and Infrastructure and its supporting Departments and Authorities, currently plays a critical role in the development and maintenance of the network.

The percentage share of Transport Sector contributed by road sub-sector has averaged 64% over the four years to 2010. Air transport is the only other dominant mode at close to 20%. Rail is the main competitor for overland freight transportation, but its average share does not usually exceed 1% due to cumulative under-investment. Transport Services accounts for about 10%. Road transport accounts for about 93% of all freight and passenger traffic in Kenya. Roads are key enablers for economic, social and political development.

It has been recognised that research has an increased role in the development and management of the infrastructure. It is expected that more focussed activities will provide the basis for improving the long term capacity to undertake relevant, high quality, research that will assist Government develop evidence-based policy and programmes and also assist in the process of evaluation and monitoring to provide continual improvement in the transport sector.

3.2 Assisting Development of Transport Policy

The 2030 Vision aspires for a country firmly interconnected through a network of roads, railways, ports, airports, water and sanitation facilities, and telecommunications. By 2030, no region of the country would be classified as “remote”. In addition, the City of Nairobi would be firmly interconnected through a network of roads, railways, ports, airports, waterways and telecommunications. The Vision proposes intensified application of Science, Technology and Innovation to raise productivity and efficiency levels. It recognises the critical role played by research and development (R&D) in accelerating economic development in all the newly industrialising countries of the world. The Government will create and implement an STI policy framework to support Vision 2030. More resources will be devoted to scientific research, technical capabilities of the workforce. Key transport plans and flagship projects proposed included:

- The First National Spatial Plan:
- A 50-year Integrated National Transport Master Plan:
- Dredging and /deepening of Mombasa Port
- Nairobi metropolitan region bus rapid transit system
- Development of light rail for Nairobi and its suburbs:
- Development of a new transport corridor to Southern Sudan and Ethiopia:
- Rehabilitation and maintenance of airstrips and airport expansion and modernisation:
- Ferry Services Programme

Key Transport Plans and flagship projects identified in the Jubilee Manifesto include:

- Prioritise and upgrade rural road, feeder road and major road network
- Improve and upgrade rail network to increase freight from 5% to 50%
- Construct commuter rail networks in all major cities
- Reconstruct JKIA and make it a regional airport hub
- Expand network of airstrips
- Develop national and international ports
- Develop policies to ensure safety of the transport system

The Integrated National Transport Policy (INTP, 2009) sets out the agreed roadmap of policy development of the different transport modes which is being used to inform policy formulation.

Relevant Strategic Theme priorities comprise:

- | | |
|----|---|
| A. | Develop and manage transport infrastructure to facilitate efficient movement of goods and people whilst ensuring environmental sustainability |
| B. | Research and development for an efficient transportation system |
| C. | Develop and enforce regulations and standards for safe, secure and efficient transport systems |
| D. | Mobilise resources and capacity building. |

The INTP sets out critical issues and policy for Transport Research and Development, as follows:

- **Critical Issues**

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.

- **Policy**

The GoK will establish a National Transport Research Institute to undertake research into aspects of transport and encompass all modes and will further provide appropriate incentives for the private sector to invest in transport research and development. It will also carry out research on road safety in collaboration with NTSA>

The critical issues for the various transport modes are identified in the INTP as:

ROAD TRANSPORT

Transport by its nature is ever changing and requires organized research to be carried out on a continuous basis. This will facilitate in development of a data bank from which trends in the sector can be monitored and projected. Areas, which require research to be carried out, among others, are:

1. Cost-effectiveness/benefits of transport sector interventions including master plans
2. Available road building materials and how they behave
3. How available local materials can be improved to meet set standards and specifications of road building and maintenance
4. Trends in road safety situation to show what types of interventions are required
5. Incorporation of NMIMTs
6. Relationship between transport and socio-economic development.

RAIL TRANSPORT

To achieve safe and effective rail service delivery, there is need to undertake research to support the development of a sustainable rail transport system. Railways currently do not have research facilities for materials, equipment and operations and for studying human behaviour.

MARITIME TRANSPORT

Development of the maritime transport industry in Kenya has been hampered by lack of research and development systems. Research and development is an important component of any modern maritime transport industry and further complements the preservation of the marine environment.

INLAND WATERWAYS TRANSPORT

Inland waterways transport system requires research on appropriate infrastructure and operational systems. Research is also required to undertake hydrographic and survey studies to develop charts that can be used for operations on a lake.

AVIATION

Effective operation and management of the aviation industry, including the formulation of policy, requires adequate statistical data and information.

3.3 Institutional Setting and Reform

The current institutional framework of the roads subsector is under review. Three existing Authorities - representing Rural Roads, Highways and Urban Roads; and a Roads Board are responsible for the management and development of the various road classes, reporting to the Principle Secretary (Infrastructure).

Four functional Departments and an Institute perform complimentary activities, as follows:

- Materials Testing and Research Department (MTRD)
- Roads Department
- Quality Assurance Department (QAD)
- Mechanical and Transport Department (MTD)
- Kenya Institute of Highways and Buildings Technology (KIHBT)

Reforms under consideration are transformation of MTRD, KIBHT and MTD into Semi-Autonomous Government Owned Entities (GOE's) in order to efficiently provide services to a Roads Authority and to the private sector. As the same time, consideration is being given to the INTP proposals to broaden MTRD's remit to Transport Research.

The precise scope of the Transport Research Centre and associated activities should be discussed and agreed and incorporated into its Mandate. Whilst it is relatively straightforward to apply MTRD's skills and expertise to similar activities to those it currently undertakes, such as runway pavement designs or rail infrastructure maintenance, it is likely that operational or vehicle-related activities would be included.

3.4 Research to Support Government Road Targets

Specifically, in relation to roads, the Government targets are:

- 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.

The transport research centre will need to implement research to address these specific requirements.

3.5 Regional Research Needs

Significant changes are taking place throughout Africa in how research is carried out and implemented. Government research Institutes or units are currently under development in Ethiopia, Mozambique, and South Sudan as well as South Africa; and are being considered for Uganda, Tanzania and Ghana.

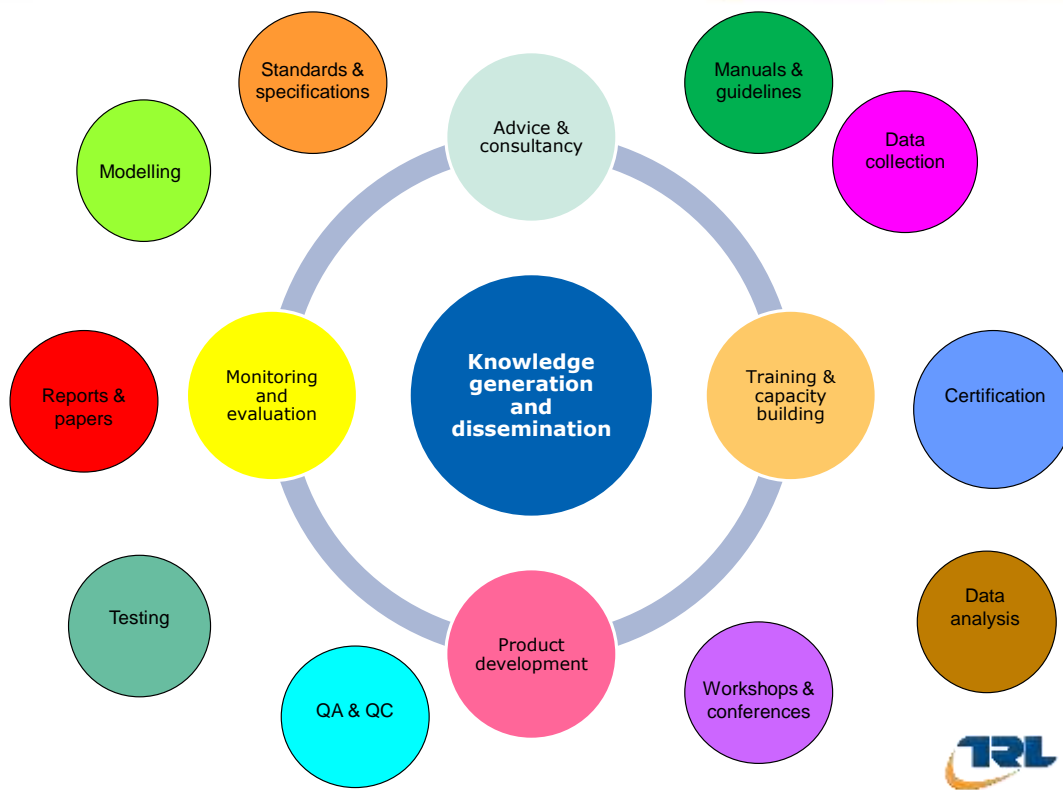
As part of a regional research initiative, plans are being considered to establish regional research hubs and Kenya is extremely well placed to take on that role for East Africa.

4 DEVELOPMENT OF SCOPE AND TRANSFORMATION MODEL

It is planned to develop of a research centre of excellence with much enhanced facilities and infrastructure with a linked capacity building programme. These plans would require a financial support from a number of sources such as MOTI, Roads Board, AFCAP, EU and World Bank to create a long term funding platform. Within a long term Government Transport vision, MTRD would be ideally placed to become a Road and Transport Research Institute and eventually an East African Regional Centre of Excellence.

4.1 Scope of Research Activities

Typical activities to deliver research strategies and programmes are set out in Figure 1.



MTRD already covers many of the activities in the outer circle in relation to roads. In future it will seek to provide more services relating to the inner circled activities comprising:

- Training and capacity building
- Product development
- Advice and consultancy
- Monitoring and evaluation.

Road and transport research is designed to address national and regional policies and to reflect, strategies, priorities in order to deliver programmes, plans and projects, See Figure 2 below. Monitoring and evaluation is essential to determine effectiveness of the activities and to inform future policy improvements. This section of the report addresses relevant policies and strategies in order to inform the research process. Research and development (R & D) is needed to provide new methods, materials, and practices for the roads sector, and technology transfer in terms of dissemination and implementation are needed to ensure that the R & D results are implemented by roads agencies. As illustrated in Figure 3, the sequence of events from the research idea to implementation of the research product comprises a number of inter-dependent, decision-making activities with the same issues having to be dealt with in different policy arenas. Moreover, the various inter-linked processes tend to be iterative, involving numerous activities and feedback loops.

The path from research, through development, to dissemination and full implementation can vary widely over time, depending on a variety of factors including the type and complexity of the

research, the relative advantage it offers over existing practice, how easy it is to be trialled, compatibility with existing standards and practice and attitudes to risk.

Figure 1: Typical research activities carried out in a research institute (courtesy TRL)

Vision	Sets out the country's <i>goals</i> and objectives in the transport sector, including a <i>vision</i> for transport and road research.					
	Policy	Based on the <i>Vision</i> ; sets out the <i>policy</i> on research. Requires legislative support.				
		Strategy	Develops a <i>strategy</i> for achieving the research <i>policy</i> .			
			Programs	Incorporate research policy and strategy in national <i>programs</i> .		
				Plans	Detail specific means of achieving research programs	
					Implementation	Ensures agreed <i>plans</i> implemented within broader <i>programme</i> on research.
					Monitoring and evaluation	Checks whether projects achieved policies

Figure 2: Elements of an enabling framework on transport and road research

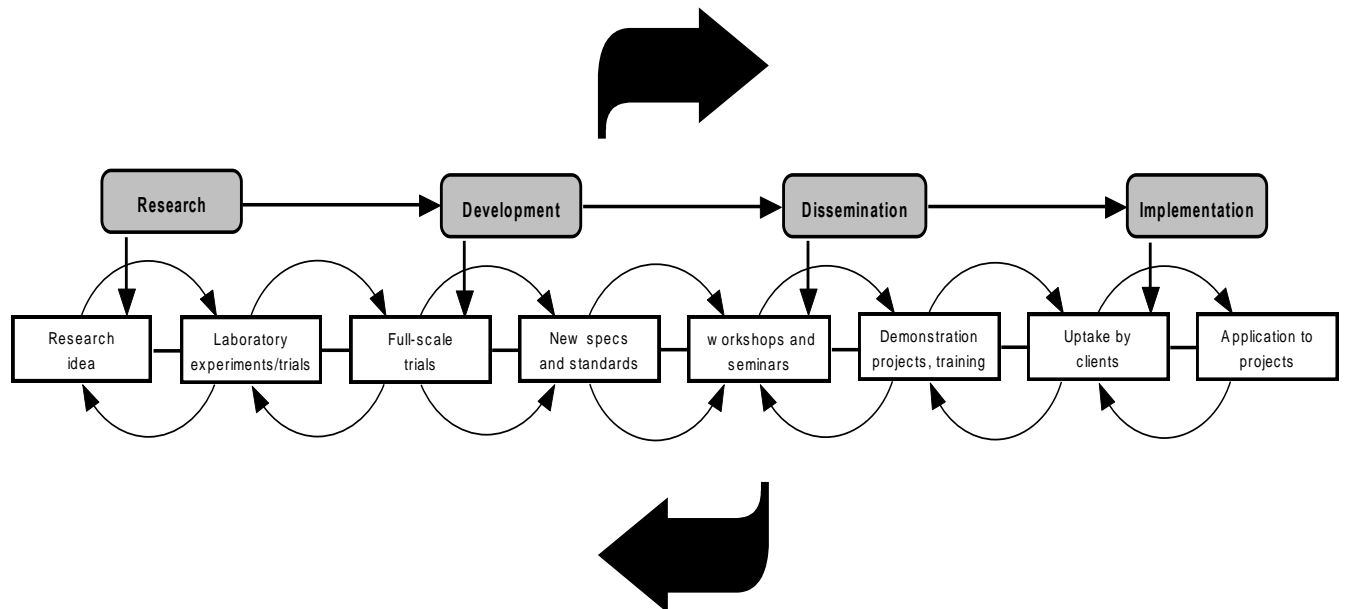


Figure 3: Processes for developing and implementing research

4.2 Alternative Models for Transformation

MTRD's current mandate is testing and research on roads and building construction materials, road pavement design and construction specifications, construction quality control and assurance, and post construction evaluation of roads and other infrastructure.

The Integrated National Transport Plan (INTP, 2009) sets out a policy to establish a National Transport Research Institute to undertake research into aspects of transport and encompass all modes .

Options and Recommendations

Policies on scope of research, relating to the decision whether the Centre addresses 'transport' and 'roads' depends on a number of factors including:

- Is research needed to inform roads policy, transport policy or integrated transport policy?
- What are the current strategies and priorities for economic development?
- How well developed is transport infrastructure?
- Can research for both be afforded?
- Is there a current institute capable of taking on a transport research mandate?

There are three basic options being used internationally:

1. Road Research Centre only

These were established historically to support roads infrastructure development programmes. National examples include India, Australia, Ethiopia, Tanzania, Ghana and Mozambique. In Africa road research centres have historically been separate because of the low priority of other modes of transport. That situation is changing.

2. Separate Road and Transport Research Centres

With the accelerated growth of maritime, aviation and rail transport and the need for integrated logistics and freight, many countries have evolved some form of transport research as well as roads. In some cases the research Centre's have evolved in Universities, in others research has just been for one mode of transport (eg rail or aviation). Roads have almost always been more dominant. Examples are America, China and France.

3. Combined Road and Transport Research Centre

With the rapid increase in multi-modal transport, transport hubs, integrated journeys, transport services, Integrated transport systems (ITS) there is an increased emphasis on transport research, freight and journey management. Examples of partially or fully combined research centres are UK, Sweden, Germany, Czech Republic. There are a number of Transport research Centres in Europe, see below;



(Courtesy ECTRI)

It is recommended that MTRD is transformed into a Transport Research Centre and there is an agreed evolutionary path to incorporating transport activities from its current road specialisation.

That pathway comprises:

- Legal Instrument established with Draft Bill and subsequent Act of Parliament
- Budget and strategic plan approval
- Priority on supporting the roads programme and building relevant capacity and skills
- Establish transport research in areas complimentary to MTRD’s road programme, such as railway infrastructure, geotechnics, airport pavements, transport data and modelling.
- Establish Divisions for the different modes of transport

- Through agreement on Government prioritisation and transport stakeholders, build additional skills and capability and links to other Centres of Excellence, academia and international institutes to build new research skills in both roads and transport.

4.3 Models for Institutional Setting and Funding

Decisions on institutional setting and level of autonomy is affected by a number of considerations. Some of the relevant factors include:

- Extent of desire to introduce creativity, flexibility, independence, impartiality and self-determination of an institute
- Ability of government to achieve step change improvements in levels of administrative beaurocracy, standards of leadership and management, procurement and delegation of powers to an institute
- Level of recognition of unique nature of R & D and related scientific excellence and the need to have a separate style of management and development of the institute and its scientists.
- Level of commitment to establishing and maintaining a true Centre of Excellence
- Ability to fund R & D in a sustainable manner from a range of sources
- Ambition to become a regional hub and international Centre.

Options and Recommendations

Set out below are three simple illustrative institutional models for the establishment/transformation of a Transport Research Centre. These are based on current international practice on scope and institutional setting for road and transport centres. Specialist knowledge and expertise is needed to cover legal definitions of companies, corporations, institutes, private and public sector organisations, their appropriate funding models, and related precedents.

1. **Integral** part of a Ministry of Transport or Roads, usually associated with a Central Materials Laboratory. Examples of Government Research Centres are:
 - Central Road Research Institute, India (CRRRI)
 - VTI, Swedish Transport Research Centre
 - CML, Tanroads , Tanzania
 - LCPC, France

Funding: From Exchequer for establishment, facilities and staff. Any external work or testing returned to government. Research programme budget agreed through negotiation annually. Non spent budget returned annually.

Advantage: In-house and its priorities are set by Government. Can carry out collaborative work ‘government – to – government’. Ability to carry out external work through approval.

Disadvantage: Managed by public administrators so constrained by government procurement, little direct control and potential beaurocracy restrictions. Research dictated by current government policies and strategies. Remuneration tied to Government grades and employment packages so can be difficult to recruit and maintain high caliber staff.

2. **Semi-Autonomous Government Agency (SAGA).** A semi-autonomous government agency is a semi-private agency where it operates without government supervision under its own charter. A government ministry or department is managed by the public administrators. Usually, the former delivers its services more promptly because of the business nature while the latter is purely a public service.

Are established using statutory instruments to provide services and an Act of Parliament.. Institutionally, can be as close or independent of Government as is necessary to meet its Vision, Mission and objectives. Usually has some form of Board of Directors and a CEO. Government may appoint the CEO or a Chairman and Non-Executive Directors. Directors have responsibilities and liabilities through a Companies Act.

Examples of SAGA's are:

- Australian Road Research Board (ARRB)
- South African Council for Scientific and Industrial Research, Transportec, CSIR

Funding: Majority of funding from Exchequer, with rest from wide range of clients, including international governments. Surplus funding can be reinvested back into research and facilities.

Advantage: In-house with priorities set by Government but with management control by Agency on development and commercial activities. Some autonomy on business and staff development. Independent remuneration packages are flexible so recruitment and retention not normally a problem.

Disadvantage: Limited accountability and financial capacity. The exchequer is expected to take on any contingent liability and financial overruns.

3. **Private Company.** There are several categories of 'private company' and Non-State Actors (NSAs).

A private company limited by shares, usually called a private limited company (Ltd) or a company limited by guarantee incorporated under national laws. It has shareholders with limited liability and its shares may not be offered to the general public, unlike those of a public limited company (plc).

A privately held company or close corporation is a business company owned either by non-governmental organizations or by a relatively small number of shareholders or company members which does not offer or trade its company stock (shares) to the general public on the stock market or exchanges, but rather the company's stock is offered, owned and traded or exchanged privately. More ambiguous terms for a privately held company are unquoted company and unlisted company.

Normally has a Board of Directors. There will be minority or zero shareholding by Government. Government contracts subject to open competition from consultants and SAGA's.

Privatisation of public to private sector organisations has taken place.

Funding: wide range of clients, including government, normally through a competitive bidding process. Examples of private research organisations in the road and transportation sector are rare:

- Transport Research Laboratory (TRL Ltd), a subsidiary of a non-profit distributing parent company, TRF, limited by guarantee through around 80 sector members. Formerly a Government Research Department.
- Transportation Research Board, TRB, a Division of the National Research Council— a private, non-profit distributing institution that is the principal operating agency of the National Academies

Advantage: Full control over commercial activities and operational management. Ability to mix national /international work and public/private work. Also able to build business entrepreneurially. Ability to invest and re-invest internally and to create subsidiaries and Joint Ventures. Remuneration packages set by market conditions.

Disadvantage: government has no control. Potential loss of underpinning Government work and business exposed to market threat of competitors and ownership. Research programme dictated purely by markets.

There is a further category of business, which is a **corporation**. It can be public or private, is an organization formed with governmental approval to carry on business (or other activities), which can issue shares of stock to raise funds with which to start a business or increase its capital. One benefit is that a corporation's liability for damages or debts is limited to its assets. For private business corporations the Articles of Incorporation must include the name of the responsible party or parties (incorporators and agent for acceptance of service), the amount of stock it will be authorized to issue, and its purpose. Corporation shareholders elect a board of directors.

Examples of exemplary national research institutes, covering both roads and transport, are set out in the Appendix. They comprise:

- ARRB, Australia
- TRL, UK
- CSIR, South Africa
- Transportation Research Board, USA

They demonstrate a wide variety of institutional setting, remits, legal status, management, strategies and delivery mechanisms from which the following recommendation is made:

It is recommended that Kenya Government transforms MTRD into a Transport Research Institute as a SAGA.

This is based on the following observations:

- When a research centre is wholly **integral** to a Ministry it does not have sufficient control on cash flow, investment and planning and is subject to the vagaries of annual budgets and external influences. Where a Government is constrained by beaucrocity, inefficient procurement and administrative procedures, this adversely affects the performance of the centre. Recruitment and retention is a systemic problem unless remuneration is competitive.
- A **private company** needs sustainable income from a range of clients, to be competitive and to have excellent facilities and staff to be sustainable. Although a number of Governments aspire to this institutional setting, there are very few successful examples in practice.

- In principle, a **SAGA** has all the advantages of the other options but with very few of the disadvantages. Its establishment and facilities are paid annually through a line budget item and periodic investments are negotiated. A funded government research programme, covering all relevant Directorates/Agencies, is set and approved by 1/3/5yr budgets. The government research-funded programme is topped up by contracts with other Governments, public and private clients and the surpluses reinvested back into additional facilities and self-funded research.
- MTRD is a functioning research and testing centre with a long history of delivery and a high reputation for quality and standards. It is understaffed, under-resourced and its buildings and facilities are in need of rehabilitation and replacement. Through careful investment and independent management, it is extremely well placed to deliver a very high Return on Investment (ROI) and, through its research programme, be instrumental in delivering the onerous targets and required reduced costs of transport construction and management. **To achieve this, MTRD will need external assistance in its transformation and capacity building over several years.**
- Support **funding** to transform MTRD into a Centre of Excellence is potentially available from the World Bank and from DfID (AFCAP)/EU grants. External research funds are potentially available from Development Partners, if capacity can be increased.

4 RECOMMENDED MODELS AND STRATEGY FOR DELIVERY

There are 2 key components for delivery of an operational Research Institute:

1. **Management of the transformation and establishment of a newly formed Institute**
2. **Operational delivery and management of a challenging and broadened research programme**

4.3 Management of transformation and establishment of an Institution

Transformation from a Department to a semi-autonomous Agency will have several stages of development, with plans to be made and implemented in the short term to initiate the process. It is intended to transform to an Institute whether the SAGA takes place or not and so most of the activities remain the same.

Phases, roadmap and programme **components** envisaged are:

Phase 1: Preparatory Studies for transformation (6 months)

This report covers Phase 1:

- MTRD's draft strategic plan for research capacity building to support transport and infrastructure development and maintenance

- Strategy for research capacity and scope out research projects to support upgrading of 8,000km of unpaved rural roads to low volume sealed standards in the next five years
- Development of Concept Model and Strategy for Transport Research Centre
- Overseas benchmarking visits

Phase 2: Studies and preparations for transformation (6 months from Feb 2014)

Will be developed through an EU TA grant, and comprises:

- Finalise strategic plan for research capacity
- Finalise research scope to support upgrading 8,000km of LV roads
- Contribute to the establishment of a research forum
- Detail the model concept and strategy for transformation
- Carry out scoping and procurement activities for phase 3.

Phase 3a: Implementation Preliminaries (6 to 12months)

Will be developed through procurement and comprises:

- Procurement of Programme Management consultant
- Procurement of legal, technical, architectural and engineering consultants
- Legal Instrument established with Draft Bill and subsequent Act of Parliament
- Programme management plans
- New Facilities design concept
- Detailed Implementation, administrative and HR plans
- Budget and strategic plan approval by MOTI
- Treasury approval of budget
- Agreement on priority research projects and funding model
- Funding arrangements with Banks and development partners

Phase 3b: Implementation (24 to 36 months)

Will be developed through procurement and comprises:

- Procurement of international research institute services
- Procurement and implementation of research programmes
- Operational set up and establishment
- Detailed design of buildings and facilities
- Procurement of contractors and construction supervision
- Development and capacity building programme to become a national centre

Phase 4: Development (up to 10 years)

- Construction of buildings, facilities and regional laboratories
- Long term training and capacity building
- Long term development and optimisation to become a sustainable internationally recognised Institute.

The **components** have a number of activities associated with them. Some of those activities would be managerial, others technical/projects or operational. The model is designed so that different elements are capable of being funded from a number of sources in combination. Those sources are planned to be:

- **Offices and Laboratories:** MOTI, World Bank
- **Staff, establishment and facilities:** MOTI, Roads Board
- **Long term TA Support for underpinning and capacity building:** AFCAP, EU
- **Core Programme Management Contract:** World Bank
- **Projects:** World Bank, AfDB, other Development Partners, Roads Board, Consultants, Contractors, Product Manufacturers
- **Specialist Training:** AFCAP, EU, Roads Board
- **Equipment:** World Bank and AFCAP.

4.3 Operational delivery and management of broadened research programme

In order to achieve the transformation in an orderly fashion, to grow capacity and also to deal with the challenges of delivering a very ambitious government roads programme, support will be needed to MTRD in a number of disciplines and related activities. Support needs will change and evolve through the above phases and there will need to be flexibility in the means of delivering the support services. In these circumstances it is preferable to commission a single organisation to perform a complete Programme Management function, who will coordinate and direct activities; and to secure a range of services through a consortium agreement and from short and long term sub-contracts.

The organisational delivery will have four key components:

- PROGRAMME MANAGEMENT
- INSTIUTIONAL AND COMMERCIALIATION
- INFRASTRUCTURE/ESTABISHMENT IMPLEMENTATION
- TRASPORT RESEARCH DELIVERY

PROGRAMME MANAGEMENT	<ul style="list-style-type: none"> ■ Plan, coordinate and deliver 5 to 10 year programme ■ Procure and manage components and delivery ■ Organise finances, funding and cash flow
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The Programme Management Unit (PMU) will have demonstrable international experience of road research and its implementation. It will direct the transformation and coordinate the programme of activities to deliver an operational Institute through the Phases.

It will examine selected international institutions and their operations and experiences in order to use appropriate best practice, adapted to local needs. It will establish all necessary collaborations, consortia and subcontracts to perform all component tasks, plans, projects and operations.

The involvement of national and international stakeholders, Development Partners, the research community and international experts is a very important component and their support and participation in the development of research capacity is a prerequisite.

The output of this overarching Contract will be a financially sustainable Institute that has all the facilities and skills necessary to deliver a national research programme and disseminate results that directly contribute to national economic growth.

Institutional and Commercialisation

- Transformation to SAGA/Institute
- Business and operational plans and implementation
- Commercial Development plans and implementation
- Funding, bids, contracts

Organisational and administrative transformation plans are required for commercialisation of laboratories, product testing and technology development. Extensive support needed in producing international Standards and Manuals, in training and capacity building. Assistance is required to build and progress relations with donors and other funders to develop and implement a commercial business development and management strategy.

The Institutional and Commercialisation component is the development of the business case, business plans and commercial plans through Years 1 to 3, 5 and for periods 5 to 10 years. Detailed plans are required for the first three years with milestones, deliverables and measured outcomes. A full roadmap is required with detailed priority actions, activities and associated finances, cash flow and costs.

The procured consultants will use their experience in establishing and transforming national research capability and in the successful delivery of output/outcomes and their contribution to the national economy. Their experience and capability in securing government and external contracts will be used to win profitable work streams and to build local capacity.

These plans will include for enhanced offices, facilities, laboratories, survey and testing capability, both in Nairobi and at the Local Authorities.

It is proposed that the establishment of the buildings, laboratories and facilities are managed and directed by the Programme Management Consultants. The Chief Engineer, MTRD will use the services of a TA to oversee them. A series of subcontracts are envisaged to establish the physical infrastructure. In addition, a range of STE's are envisaged for specific specialised inputs.

Infrastructure/ Establishment Implementation

- Buildings, facilities, laboratories, equipment and services
- Regional laboratories and services
- HR implementation, capacity building & strengthening
- Operational management and quality

The delivery of improved buildings, laboratories and facilities; and their operational management, must be planned, costed and programmed around current operations. The design concept, its phases and its implementation will need to be developed so that Detailed Designs and associated Construction Contracts can be let. The Design Concept includes the production of concept drawings, plans, 3D perspectives, inventories and sketch layouts for Labs/Offices/Conference facilities.

Experts and advisors will be needed to plan these works and activities and to provide capacity building. These will include:

- Architect
- Facilities and design concept advisor
- Knowledge management, IT and ICT expert
- Laboratory services expert
- Research operations expert
- Financial/budgeting expert
- Transport experts

It is noted that there will be overlap between the activities in this component and the Institutional and Commercialisation component.

Transport Research Delivery

- Strategic planning and project proposals
- Project manage research programme
- Technical training, audit and review
- Education and dissemination

In order to deliver the capacity building and capability in an accelerated way a collaborative approach will be used. This component may be let as one Contract. This may also involve using TA inputs supplied under various arrangements with the Development Partners. In addition to subcontracts of work, expert national and international researchers will be needed, as well as secondment of experts into MTRD. It is proposed to involve other research centres, consultants, universities and individual experts in a combination of in-house and externally commissioned studies/projects.

The largest proportion of this component will be for research on Low Volume Roads using the research strategies and priority projects already underway. Other research activities will be for national (high volume) roads and for transport services.

It is proposed to establish several Transport Research Divisions within the Institute. This will be achieved through TA services, tasked with establishing and coordinating a priority programme of research. This will initially be through external contracts and arrangements with transport specialists and will be supported by a recruitment and capacity building programme.

APPENDIX: EXAMPLES OF ROAD AND TRANSPORT RESEARCH CENTRES

ARRB, Australia

ARRB provides research, consulting and information services to the road and transport industry.

ARRB applies research outcomes to develop equipment that collects road and traffic information and software that assists with decision making across road networks.

ARRB is the leading provider of road research and best practice workshops in Australia.

Trusted advisor to road authorities for technical input and solutions

For over 50 years, ARRB Group Ltd (ARRB) has provided trusted advice, technical expertise and solutions to transport and road authorities across the world. ARRB's member agencies include federal, state and local government bodies and is a not-for-profit entity. ARRB and its members recognise the critical role they play in supporting one another to improve productivity, safety, sustainability and amenity outcomes for the public.

Key strategies include:

- conducting multi-disciplinary programs of research on national priorities for Austroads
- consulting services for members and the industry
- creating a hub for road industry knowledge and experience which provides certainty and reliability in information
- expanding knowledge sharing and transfer activities to meet industry needs
- developing and commercialising innovative technology and systems.

Areas of expertise

ARRB Group's capabilities cover the full spectrum of road transport operations including:

- materials, pavement and concrete design and testing
- transport policy, operations and economics
- infrastructure asset management
- bridge management and evaluation
- equipment manufacture and data collection services
- road safety
- traffic engineering & road design
- heavy vehicle testing and simulation
- parking
- climate change
- land transport resources and information
- knowledge transfer and capacity building.

Customers include:

- all state and territory road authorities within Australia
- national governments in Australia and New Zealand
- local government including local councils and associations

- state government
- national bodies and associations
- Australian and international aid agencies
- transport and mining companies
- private and engineering consultancies
- major construction firms
- defence, water, parks and wildlife government departments.

Strategic Plans, Values and Vision 2011-2020

ARRB's member organisations include federal, state and local government bodies responsible for managing the nation's transport and road networks. ARRB and its members, both individually and collectively as Austroads, recognise the critical role that they play in supporting one another to improve productivity, safety, sustainability and amenity outcomes for the public.

ARRB supports the activities and outcomes of its members and other customers across a range of industry sectors by:

- delivering technical expertise in areas of particular importance to Australasian road authorities through the Sustainable Expertise Model (SEM)
- managing a \$10 million research investment portfolio on behalf of road agencies
- sourcing and disseminating to members and customers world-class research and technical information
- operating as a commercially viable and sustainable business.

Delivering sustainable expertise

ARRB leverages the technical know-how of its resident experts and those of other bodies to oversee key programs and deliver practical solutions in areas of particular importance to Australasian road authorities. This approach also fosters expertise in regions and organisations where such investment is not yet sustainable. The key to success is collaborative relationships with member agencies, data providers and other sources of technical expertise.

Managing research investment

ARRB manages on behalf of its members a portfolio of research investment in the Australasian road network. As their trusted advisor, ARRB seeks to maximise members' return on this investment, supported by appropriate education, training and knowledge-transfer activities. Ultimately, it is about ensuring road authorities have access to world-class research.

Sharing industry knowledge and technical insight

ARRB shares knowledge through an extensive network including the MG Lay Library, the ARRB Journal, ARRB's biennial research conference, workshops, industry conferences, and participation in international research and technology development activities. At the heart of this is its ongoing links with leading local and international bodies, coupled with a commitment to providing members with the latest developments.

Investing in a stronger future for our members

By seeking to recover the full cost of work it undertakes, ARRB generates funds that are subsequently re-invested in various programs for the benefit of members. This comes about by having a sound understanding of member and industry needs, efficient project delivery systems and processes, and cost-effective support functions and facilities.

The way we work

ARRB is guided by a set of values that support the needs of members and customers. We collaborate with our members to bring out the best in each other, we understand what matters most to members and customers, and we respect people for who they are and for their knowledge, skills and experience.

We also aim to understand the challenges facing members and provide relevant insights and advice, we foster innovation and undertake world-class research that benefits all road-users, and we strive to uphold the highest professional standards while providing sound advice from a position of independence.

Bringing our work to life

While the provision of world-class research and advice is at the core of our business, ensuring it has practical application ensures road authorities and the broader transport sector can leverage our insights for the benefit of all road users.

WAPARC

The Western Australian Pavement Asset Research Centre (WAPARC) is a collaboration between ARRB, Main Roads Western Australia and several WA universities. It has a dual aim of developing pavement research capability in Western Australia and investigating pavement performance. ARRB acted as trusted pavement research advisors to Main Roads before the establishment of WAPARC and is fulfilling the Centre Director role, ensuring its focus on local issues while informing and being informed by the National Austroads program.

TSD and ROADCRACK

ARRB is working collaboratively with an international equipment developer, Austroads and our members to better understand and maximise the potential benefits of new technologies for assessing the structural capacity of the \$200bn road network. The Traffic Speed Deflectometer and RoadCrack offer a means of doing this with considerable cost and safety benefits.

Local Government PBS Access Tool

A major barrier to increased national productivity of the \$60bn freight task is 'last mile access' for large vehicles on local roads. Using research from several disciplines, ARRB is working with national, state and local government stakeholders to develop a means of rapidly assessing the suitability of local roads for carrying and safely accommodating large higher productivity vehicles.

Rail Knowledge Portal

The MG Lay Library has been commissioned to develop and maintain a knowledge bank of rail research and information by the co-operative research centre (CRC) for rail innovation, giving our members access to information relating to both major forms of land transport, reflecting their own increasing integration into the broader transport portfolio.

TRL, UK

TRL provides independent and impartial world-class research, consultancy, testing and certification for all aspects of transport.

Originally established in 1933 as part of the UK government, TRL privatised in 1996 to become a fully independent private company. TRL is wholly owned by the Transport Research Foundation (TRF), a non-profit-distributing foundation with no shareholders, enabling profits made by TRL to be passed to TRF and re-invested in scientific research. TRF is comprised of over 80 sector members from the transport industry, ensuring TRL continues to undertake the high-quality research it's renowned for.

We're committed to working with a wide range of customers in both the public and private sectors to help create the future of transport. Our 320 staff, many of whom are world-recognised experts, work at the cutting edge of transport, generating innovative solutions for customers on a wide range of projects from transportation to safety and environmental issues, from risk and infrastructure management to simulation and testing.

TRL's unique facilities ensure we're ideally placed to provide appropriate solutions to our customers and enable us to meet their wide range of requirements.

People

Rob Wallis is Chief Executive of TRL and its parent company, the Transport Research Foundation (TRF). Rob has over 30 years of ICT and professional / business services leadership experience, working across private, public and non-profit sectors in the UK and internationally. Industry specialisations include transport, logistics, supply chain and automotive sectors. Before joining TRL in 2013, Rob was with BSI (British Standards Institution) as Managing Director, Europe, Middle East & Africa (EMEA), an international division serving clients in over 70 countries. Prior to BSI, he held managing director and senior director roles leading transport-focused businesses at EDS, LogicaCMG and Hedra, having begun his career at the CAA.

Tim Andrews

Finance Director

Tim is the Finance Director of TRL and has 25 years experience working in medium-sized enterprises, mainly in Senior Finance Roles. Before taking on his present role, Tim led TRL's Transportation and Product Testing Divisions. He is a Fellow of both the Chartered Institute of Management Accountant and the Chartered Institute of Highways and Transportation.

Ian Graham

Commercial Director

Ian is Commercial Director for TRL and a Director of TRL and TRF. Ian has over 30 years' experience leading and working in businesses, primarily technical consultancies, across a range of high hazard/high business impact market sectors including road, rail and aviation. Ian is responsible for TRL's strategic and operational growth which includes international and rail expansion. He is a Chartered Director and Fellow of the IoD.

Tim Strong

Director, Transportation

Tim is responsible for TRL's Transportation Division, delivering innovative services and solutions to clients in software development (products and consultancy), urban and inter-urban network performance, human factors, driving simulators, simulation and modelling and Intelligent Transport Systems consultancy. Tim has over 10 years experience in delivering transportation projects and programmes of work.

Bob Collis**Director, Infrastructure**

Bob has over 30 years experience in the appraisal, development and design of highway, airfield and public transport schemes. Bob is responsible for TRL's Infrastructure and Environment Division, serving UK and international customers in infrastructure design, asset management, environmental assessment and sustainability. He's also responsible for TRL offices in Scotland and Wales.

Neil Paulley**Director, TRL Academy**

Neil has 35 years experience in transport planning and has worked extensively in the area of transport policy and demand forecasting. As Director of the TRL Academy, Neil has responsibility for science and engineering activities and their strategic development at TRL, for formulating and ensuring delivery of long-term research programmes and for ensuring technical quality across the company.

Customers

A TRL customer is often a customer for life. We consistently strive for excellence in the way we deliver projects and share knowledge.

Our respected industry reputation speaks for itself. A collaborative approach, exceptional customer service and innovative technical abilities mean we consistently win projects in a challenging market.

We have robust partnering relationships with many government organisations in the UK and internationally as well as with many private organisations. Key customers include the Department for Transport, the Highways Agency and Transport for London as well as Shell, QinetiQ, O2 and Pfizer, to name but a few.

Our customers include organisations from multiple sectors including:

- governments
- consultants
- emergency services
- IT
- motor sport
- security
- legal
- software
- local authorities
- manufacturers
- commerce
- aid agencies
- regulatory bodies.

Transport Infrastructure Engineering, CSIR, South Africa

Projects are undertaken in collaboration with international, national, provincial and municipal road authorities and agencies, universities, private sector associations, consultants, manufacturers, producers and contractors, while international networks facilitate the transfer of cost-effective technologies to South Africa. Team members also transfer knowledge to build sector capacity locally.

Core focus areas

- Road engineering and materials
- Rail infrastructure engineering.

Capabilities, research areas, competences and facilities

Capability	Pavement design and construction
<i>Research areas</i>	Design, construction and maintenance of transport infrastructure assets (roads, streets, airports, railways); and support a sustainable and cost-effective transport network
<i>Competences and facilities</i>	<ul style="list-style-type: none">• Materials, including traditional, alternative, waste and novel materials, also supporting environmental engineering and climate change mitigation and adaptation• Engineering design, analysis and modelling supporting sustainable construction• Vehicle-pavement and infrastructure-environment interaction• Geotechnical engineering
Capability	Accelerated pavement testing
<i>Research areas</i>	Data on behavioural characteristics and performance of road pavement materials and structures; accelerated loading testing; and international collaboration in accelerated road pavement testing
<i>Competences and facilities</i>	<ul style="list-style-type: none">• Performance data capturing techniques and instrumentation• Real field characterisation of material behaviour (as opposed to laboratory models)• Structural capacity determination of existing road structures• Comparative testing of various road pavement structure types
Capability	Advanced materials testing
<i>Research areas</i>	Standard and special testing services; and development of specific equipment and test methods to meet the transport infrastructure engineering sector SET needs
<i>Competences and facilities</i>	<ul style="list-style-type: none">• Soils and granular materials laboratory• Asphalt laboratory• Dynamic testing laboratory

- Bituminous binders laboratory
- Chemical laboratory
- Mechanical workshops

Transportation Research Board, USA

The mission of the Transportation Research Board is to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal.

TRB IN THE NATIONAL ACADEMIES

TRB is one of six major divisions of the National Research Council— a private, non-profit institution that is the principal operating agency of the National Academies in providing services to the government, the public, and the scientific and engineering communities. The National Research Council is jointly administered by the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. TRB’s varied activities—described below—annually engage more than 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest by participating on TRB committees, panels, and task forces. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

SERVICES

A resource to the nation and to the transportation community worldwide, TRB provides an extensive portfolio of services:

- ▶ Opportunities for information exchange on current transportation research and practice,
- ▶ Management of cooperative research and other research programs,
- ▶ Analyses of national transportation policy issues and guidance on federal and other research programs, and
- ▶ Publications and access to research information from around the world.

Fostering Information Exchange

TRB conducts a variety of programs and activities designed to support dialogue and information exchange among researchers, practicing transportation professionals, and others concerned with transportation.

Annual Meeting

Each January, more than 10,000 transportation professionals from around the world—including representatives of federal, state, and local government agencies; universities; and industry—gather in Washington, D.C., to participate in the world’s largest forum designed specifically for the formal and informal exchange of information among transportation researchers and

practitioners. Approximately 3,000 presentations, including more than 1,500 peer-reviewed technical papers, are given throughout the week of this gathering. In addition, more than 200 TRB standing committees and numerous subcommittees hold open meetings to discuss current research and identify research needs.

Conferences and Workshops

Every year, TRB organizes 70 or more specialty conferences and workshops on subjects and issues of interest to the transportation community. These events provide opportunities for information sharing and in-depth exploration of specific topics, ranging from low-volume roads and statewide transportation planning to light rail transit, marine salvage, highway safety, and community impact assessment.

Standing Committees and Task Forces

In 1920 the Board established three technical committees to promote research and disseminate highway research findings. Today TRB maintains more than 200 standing committees and task forces that address all aspects and modes of transportation. More than 4,000 administrators, operators, engineers, attorneys, researchers, educators, and others concerned with transportation serve on these committees and task forces without compensation. Committee members identify research needs; provide information to the transportation community on research priorities and procedures; review papers for presentation at the TRB Annual Meeting and for publication; encourage the incorporation of appropriate research findings into practice; and develop special programs, conferences, and workshops. Standing committees and task forces are organized into 11 groups, each overseen by a separate council. Six of the groups, including some 150 committees, address various functional aspects of transportation, with a major focus on highways. Each of the remaining five groups concentrates primarily on a specific transportation mode.

<p>Modes Public Transportation Freight Rail Aviation Marine</p>	<p>Functions Policy and Organization Systems Planning and Environment Design and Construction Operations and Maintenance System Users Legal Resources</p>
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Electronic Networking

Information on the Board’s organization, committee activities, and upcoming conferences and meetings, as well as most recent full-text reports, can be found on TRB’s website (www.TRB.org). Users can search the current Publications Catalog and order reports online, apply to become a TRB affiliate, and register for the Annual Meeting and other events. TRB also distributes a complimentary weekly electronic newsletter, which provides timely information on

TRB reports and activities as well as other news and information of interest to the transportation community. In addition, many TRB committees host electronic mailing lists and discussion groups that allow transportation professionals with common interests to pose questions and share information and experiences.

Field Visits

Each year, TRB technical staff visit the administrators and professional staff of all state transportation departments, many academic and research institutions, and other transportation-related agencies and organizations to exchange information concerning research and practice. These visits have four primary objectives:

- ▶ To identify specific problems and issues of importance to state departments of transportation and other transportation agencies and organizations;
- ▶ To offer assistance and information that can help in addressing these problems and issues;
- ▶ To identify topics and emerging issues that may be appropriate for TRB to address in the future, in its continuing efforts to support the needs of sponsors and the broader transportation community; and
- ▶ To assess the quality and value of services currently being provided by TRB and identify other activities or services that may help TRB better serve its sponsors and other constituencies.

Managing Research

TRB administers a number of major research programs sponsored by other organizations. The oldest and largest of these programs, the National Cooperative Highway Research Program (NCHRP), is sponsored by the state transportation departments in cooperation with the Federal Highway Administration. The Transit Cooperative Research Program (TCRP), initiated in 1992, is sponsored by the Federal Transit Administration. Both are applied research programs in which the potential users of research results have a direct role in project selection. In 2002 TRB began administering the Commercial Truck and Bus Safety Synthesis Program (CTBSSP), which is sponsored by the Federal Motor Carrier Safety Administration. The Congressionally requested Airport Cooperative Research Program (ACRP), which began work in 2006, is sponsored by the Federal Aviation Administration (FAA). Two other new programs got under way in 2006--the Hazardous Materials Cooperative Research Program (HMCRP) and the National Cooperative Freight Research Program (NCFRP), both of which were authorized in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

Under all of these programs, TRB organizes panels of experts to provide guidance on technical aspects of the research and to translate the problems into project statements with well-defined objectives. Research proposals are then solicited from private and public research organizations with capability and experience in the problem areas to be studied. The technical panels review the proposals, recommend contract awards, monitor research in progress, provide technical guidance, and determine the acceptability of the final reports. More than 3,000 experienced practitioners and research specialists currently serve on Cooperative Research Program panels. TRB also manages programs of smaller studies focused on synthesizing current practices and analyzing legal issues in both the NCHRP and the TCRP programs. Findings and publications from these synthesis and legal research projects have been well received by highway and transit practitioners.

National Cooperative Highway Research Program

Sponsored by the member departments of the American Association of State Highway and

Transportation Officials (AASHTO) in cooperation with the Federal Highway Administration, the National Cooperative Highway Research Program was created in 1962 as a means to accelerate research on acute problems that affect highway planning, design, construction, operation, and maintenance nationwide. All of the state highway and transportation departments contribute to an annual cooperative pool of more than \$30 million to fund the program's activities. AASHTO committees and member departments and the Federal Highway Administration recommend research topics each year, and the AASHTO Standing Committee on Research (SCOR) determines both the projects to be funded and the levels of funding for those projects. A close working relationship with AASHTO during execution of the projects and the participation of experienced practitioners on project panels help ensure the application of completed NCHRP study results. For example, recent NCHRP projects have developed a recommended Mechanistic-Empirical Design Guide and software for pavements to be considered for adoption by AASHTO, and the multiple volumes of a 23-volume report, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan.

Transit Cooperative Research Program

The Transit Cooperative Research Program was initiated in 1992 by three cooperating organizations: the Federal Transit Administration, the program sponsor, which has provided approximately \$8 million annually; the Transit Development Corporation, a nonprofit educational and research organization established by the American Public Transportation Association, which provides program governance through the TCRP Oversight and Project Selection (TOPS) Committee; and the National Academies, acting through TRB, which serves as program manager.

Under TCRP the transit industry develops innovative near-term solutions to operating problems and adapts appropriate new technologies and approaches to help meet the demands placed on the nation's public transit systems. The program's research covers topics relating to all aspects of public transportation, including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices. Each year, the TOPS Committee selects a program of research from the large number of candidate research problem statements submitted by organizations and individuals in the transit community. In recent years, TCRP projects have produced the second edition of the Transit Capacity and Quality of Service Manual and a series of volumens on transit security-related research, cover a variety of topics..

Airport Cooperative Research Program

The Airport Cooperative Research Program (ACRP) was authorized in legislation enacted in December 2003, and requires provision of funding through the annual federal appropriations process. ACRP, which began work in 2006, is an industry-driven applied research program that develops near-term, practical solutions to problems faced by airport operators. The congressionally authorized program is sponsored by the Federal Aviation Administration (FAA). Research topics are selected by an independent governing board appointed by the U.S. Secretary of Transportation that includes individuals from airports, universities, FAA, and the aviation industry.

National Cooperative Freight Research Program

The NCFRP carries out applied research on problems facing the freight industry that are not being adequately addressed by existing research programs. Sponsored by the Research and

Innovative Technology Administration of the U.S. Department of Transportation, NCFRP will cover a range of issues to improve the efficiency, reliability, safety, and security of the nation's freight transportation system.

The Hazardous Materials Cooperative Research Program

The HMCRP is a stakeholder-driven, problem-solving program, researching real-world, day-to-day operational issues in hazardous materials transportation with near- to mid-term time frames. The program, which began work in late 2006, is sponsored by the Pipeline and Hazardous Materials Safety Administration of the U.S. Department of Transportation.

Commercial Truck and Bus Safety Synthesis Program

The CTBSSP is a relatively small cooperative research program administered by TRB. This program, sponsored by the Federal Motor Carrier Safety Administration, supports projects that summarize existing practice in a specific technical area of commercial truck and bus safety. On the basis of an industrywide solicitation, a program oversight panel selects synthesis topics and provides general guidance for the program.

Strategic Highway Research Program 2

Congress authorized the second Strategic Highway Research Program (SHRP 2) in 2005 to investigate the underlying causes of highway crashes and congestion in a short-term program of focused research. To carry out that investigation, SHRP 2 targets goals in four interrelated focus areas:

- ▶ Safety: Significantly improve highway safety by understanding driving behavior in a study of unprecedented scale.
- ▶ Renewal: Develop design and construction methods that cause minimal disruption and produce long-lived facilities to renew the aging highway infrastructure.
- ▶ Reliability: Reduce congestion and improve travel time reliability through incident management, response, and mitigation.
- ▶ Capacity: Integrate mobility, economic, environmental, and community needs into the planning and design of new transportation capacity.

SHRP 2 is being conducted under a memorandum of understanding among the American Association of State Highway and Transportation Officials, the Federal Highway Administration, and the National Research Council. The multiyear program (four years of funding, seven years to complete) began work in March 2006. With estimated funding of about \$150 million, SHRP 2 is guided by an oversight committee and four technical coordinating committees, one in each of the four focus areas. More targeted task groups provide assistance in areas requiring specific technical expertise, including preparation of requests for proposals and review of proposals.

Innovations Deserving Exploratory Analysis

TRB also administers the Innovations Deserving Exploratory Analysis (IDEA) programs, which encourage investigation of innovative but untested concepts offering the potential for technological breakthroughs in transportation. The investigations are pursued through small contracts designed to demonstrate the feasibility of the concepts. Participating researchers respond to solicitations for proposals in areas of general interest to the transportation community. IDEA investigations have led to the development of a number of transportation

technologies that offer alternatives to current practice, as well as departures that promise solutions to long-standing problems.

The NCHRP IDEA Program, which supports highway and intermodal investigations, is funded by the state transportation departments through the National Cooperative Highway Research Program. Transit IDEA is financed through the Transit Cooperative Research Program. The Federal Railroad Administration sponsors the High-Speed Rail IDEA Program and cosponsors the Transportation Safety Technology IDEA Program, along with the Federal Motor Carrier Safety Administration.

Providing Policy Analysis and Advice

Since 1982, TRB has conducted more than 100 studies at the request of Congress, executive-branch federal agencies, the states, and other organizations on an array of complex and often controversial transportation topics of national significance. Examples include counterterrorism, truck size and weight regulation, airport capacity, transit use, high-speed rail, airline deregulation, dredging, environmental policy, school transportation safety, and automotive safety. New studies are initiated annually.

Each study is conducted by a specially appointed independent committee. Committee members are selected to represent appropriate areas of expertise and a balance of perspectives on the issues involved; members serve without compensation. The committee process is open to public scrutiny and comment, in accordance with the Federal Advisory Committee Act Amendments of 1997. Every final report undergoes a rigorous institutional review, in which outside experts examine the report in accordance with guidelines developed by the National Academies to ensure that the committee has provided a balanced and fair assessment of the topic addressed.

Examples of the impacts that specific TRB studies have had on transportation policy include: implementation of the recommendations in *The National Highway Traffic Safety Administration's Rating System for Rollover Resistance* concerning the rollover propensity of sport utility vehicles by NHTSA; the U.S. Department of Transportation's decision against recommending a regulation governing airline price competition in response to recommendations in *Entry and Competition in the U.S. Airline Industry*; and the adoption by the U.S. Department of Homeland Security of guidance from *Hazardous Materials Shipment Information for Emergency Response* in planning pilot studies for hazmat security systems.

Through special expert committees, TRB also provides a forum for conducting periodic or continuing reviews of specific transportation research and technology programs. Such committees have provided guidance on the overall highway research program, the Long-Term Pavement Performance studies, and technology transfer activities. Other study committees have provided advice on highway cost allocation studies, research programs of the Federal Railroad Administration, development of standards for intelligent transportation systems, the Bureau of Transportation Statistics' survey programs, and the federal transportation science and technology strategy.

Issuing Publications and Research Information

Through its publications and research information services, TRB disseminates transportation research results worldwide.

Publications

TRB produces and distributes about 200 publications annually. Most of the printed publications are also available electronically through the TRB website. The following are the major publications series:

- ▶ Transportation Research Records: Journal of the Transportation Research Board contain technical papers that have been accepted for publication through a rigorous peer-review process refereed by TRB technical committees.
- ▶ Special Reports present the results of policy studies, including studies mandated by Congress or requested by executive-branch federal agencies. These studies are conducted by expert committees appointed by the National Research Council (NRC).
- ▶ Cooperative Research Program (CRP) Reports, Syntheses of Practice, Research Results Digests, Web-Only Documents, and Legal Research Digests contain the findings of individual research projects sponsored by TRB's Cooperative Research Programs. Syntheses of Practice are also published for the Commercial Truck and Bus Safety Synthesis Program.
- ▶ Conference Proceedings contain papers, presentations, and summaries of discussions from conferences, workshops, and symposia convened by TRB.
- ▶ Transportation Research Circulars present technical material considered to be of immediate interest to the transportation community.

In addition, TRB issues a variety of other publications, ranging from the Highway Capacity Manual to general-interest periodicals. *TR News*, the Board's bimonthly magazine with an international circulation of 10,000, features timely articles on innovative and state-of-the-art research and practice in all modes of transportation. *Ignition*, issued quarterly, contains news of the IDEA programs. The TRB Transportation Research E-Newsletter, with more than 30,000 subscribers, provides free weekly updates on TRB reports and events, together with other news and research information of interest to the transportation community.

Online Research Information

TRB produces and maintains the Transportation Research Information Services (TRIS), the world's largest and most comprehensive online bibliographic database of published and ongoing transportation research. Currently, TRIS contains more than 600,000 records (abstracts and citations) on the various modes and disciplines in transportation, including planning, management, economics, design and construction, materials, environmental issues, safety and human factors, and operations. Each year, about 30,000 references from technical journals, conference proceedings, technical reports, and monographs are added to the database. Through a cooperative agreement with the Bureau of Transportation Statistics, the TRIS Database is available on the Internet through the website of the National Transportation Library. This service, TRIS Online, can be accessed through the TRB homepage at www.TRB.org. TRIS is also available through two fee-based services, Dialog and Silverplatter's TRANSPORT CD-ROM.

TRB produces and provides web access via www.TRB.org to a database of current research in transportation, the Research in Progress (RiP) Database. The RiP website provides access to more than 9,500 descriptions of current or recently completed transportation research projects from federal and state transportation agencies, universities, and international organizations.

The TRB Publications Index is a searchable index of the Board's papers and reports. This index now provides links to the full text of the publications or to direct ordering information. TRB's website also contains the largest database on intelligent transportation systems— the Caltrans

PATH Database, produced by the Institute of Transportation Studies at the University of California, Berkeley. The Caltrans PATH database is also included in TRIS.

Response to Inquiries

TRB responds annually to several thousand specific requests from state transportation departments and TRB affiliates for information concerning transportation research and practice. The TRB Library and TRIS staffs handle and provide personalized responses to most requests. When appropriate, inquiries are referred to staff specialists for action.

TRB: AN EVOLVING ORGANIZATION

TRB's formation and evolution have strongly shaped its mission and services. Its current organization both reflects its history and provides an appropriate framework for delivering the services that TRB provides to sponsors, affiliates, and others concerned with transportation.

History

TRB was established in 1920 as the National Advisory Board on Highway Research to provide a mechanism for the exchange of information and research results about highway technology. Renamed the Highway Research Board (HRB) in 1925, the organization accomplished its mission through standing committees, publications, and an annual meeting. In the decades that followed, HRB steadily increased in size. Information exchange remained its sole mission until the 1950s, when it began to undertake management of ad hoc research projects. The first continuing research management activity—the National Cooperative Highway Research Program—started in 1962. During the 1960s, the Board's activities became increasingly multimodal in outlook. In 1974 the Highway Research Board became the Transportation Research Board. Since then, TRB's portfolio of services has expanded significantly—first in the early 1980s, when it began conducting studies of national transportation policy issues, and again in the 1990s, when Congress, the U.S. Department of Transportation, and the state departments of transportation asked TRB to undertake additional tasks, including management responsibilities for the Transit Cooperative Research Program, guidance of ongoing research programs such as the Long-Term Pavement Performance studies, and management of the Innovations Deserving Exploratory Analysis programs. More recent additions have included new cooperative research programs in airports, freight, and hazardous materials transportation, and the second Strategic Highway Research Program.

Organization

The TRB Executive Committee, whose members are appointed by the chairman of NRC, exercises oversight responsibility for the Board's programs and activities. Members include senior transportation industry executives, top officials of public-sector transportation agencies, and distinguished researchers from academia. The TRB Executive Office provides policy and operational guidance for TRB programs and activities, oversees committee and panel appointments and report review, provides support and direction for human resource issues and staffing needs, develops and directs the Board's communications and outreach efforts, and provides staff support to the Executive Committee and its Subcommittee for NRC Oversight. The Executive Office also manages the editing, production, design, and publication of many TRB reports, including the journal series, magazine, and other titles.

TRB's programs and staff members are organized into the following divisions:

- ▶ Technical Activities supports standing committees and task forces, organizes the TRB Annual Meeting and other conferences and workshops, and conducts field visits to transportation agencies, organizations, and research institutions.
- ▶ Studies and Special Programs convenes specially appointed expert committees to conduct policy studies and program reviews, maintains the TRIS database, provides library services, prepares synthesis reports on behalf of the Cooperative Research Programs, and manages the Innovations Deserving Exploratory Analysis (IDEA) programs.
- ▶ Cooperative Research Programs manages the National Cooperative Highway Research Program, the Transit Cooperative Research Program, the Airport Cooperative Research Program, the National Cooperative Freight Research Program, and the Hazardous Materials Cooperative Research Program.
- ▶ Strategic Highway Research Program 2 manages a targeted, short-term, results-oriented program of contract research designed to advance highway performance and safety for U.S. highway users.
- ▶ Administration and Finance provides financial, information technology, and other administrative support, including financial oversight of the contracts and grants that support the work of TRB, administration of publications sales and distribution, and maintenance of benefits and services for sponsor and affiliate organizations.

The Marine Board, formed in 1965 and previously situated within another unit of NRC, became part of TRB in 1999. The Marine Board provides a forum for the exchange of information relating to maritime transportation and related economic, environmental, and technology issues in a broader context. It identifies potential topics for policy studies, conferences, and other activities. The Marine Board is administratively housed within TRB's Technical Activities Division.

Sponsors and Affiliates

Sponsors and affiliates provide support for TRB core programs and activities. The two-way flow of benefits resulting from affiliation with TRB was a key part of the Board's founding concept. Today TRB has a tiered program that allows sponsors and affiliates to customize the services and benefits they receive in exchange for their fundamental support for TRB programs and activities that are of interest to the entire transportation community. There are five levels of core support: sponsor, sustaining affiliate, organizational affiliate, individual affiliate, and student affiliate. Basic affiliate benefits include reduced registration fees for the TRB Annual Meeting, a complimentary subscription to *TR News*, discounts on most TRB books and reports, use of the TRB Library, and assistance with use of TRB computer-based information services.

Sponsors are the major source of financial support for TRB's core technical activities. Federal, state, and local government agencies and professional societies and organizations that represent industry groups are eligible to be TRB sponsors. The level of a sponsor's contribution is determined on the basis of the services and benefits an organization wishes to receive; there is a minimum annual contribution, except for state transportation agencies, whose allocations are determined by formula. Sponsors include the transportation and highway departments of the 50 states, the District of Columbia, and Puerto Rico; the component administrations of the U.S. Department of Transportation; various other federal agencies; and a number of other private and public organizations. Sponsor organizations enjoy ex officio representation on the TRB Executive Committee either directly or, in the case of the state transportation departments,

through their association. A list of current sponsors is available on the TRB website at www.TRB.org/directory/sponsors.asp.

Sustaining Affiliates include agencies and organizations that wish to contribute substantially to the support of TRB core programs but that do not elect to or, because of their status as individual corporations or businesses, are ineligible to become sponsors. Like sponsors, sustaining affiliates negotiate their contributions on the basis of the level of services they wish to receive, subject to a the minimum annual contribution. A list of current sustaining affiliates is available on the TRB website at www.TRB.org/directory/sustainers.asp.

Organizational Affiliates include organizations, institutions, agencies, and businesses, which can choose to contribute at one of three different levels of support, depending on the level of services desired. In addition to basic affiliate benefits, organizational affiliates receive most publications at no cost as well as complimentary registrations to the TRB Annual Meeting. A list of current organizational affiliates is available on the TRB website at www.TRB.org/directory/affiliates.asp.

Individual Affiliates and Student Affiliates (full-time students at accredited postsecondary institutions) enjoy basic affiliate benefits and may subscribe to TRB publications at a substantially reduced cost.

Finances

TRB's annual expenditures for program activities exceed \$90 million and will continue to grow as SHRP 2 research contracts are awarded. About 15 percent of expenditures is for technical activities (standing committees, Annual Meeting, field visit program, publications, and TRIS); 63 percent for the Cooperative Research Programs; 15 percent for SHRP 2; and 7 percent for studies and other continuing activities. Approximately 39 percent of TRB's total financial support is provided by the transportation departments of the 50 states and the District of Columbia. Contracts and grants from the component administrations of the U.S. Department of Transportation and other federal agencies provide an additional 57 percent, and 4 percent is provided by private sponsoring organizations and income from publication sales, meeting registrations, and affiliate fees.