



AfCAP
Africa Community Access Partnership



Project Scoping Study for Sierra Leone and Liberia

Scoping Study Report



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Abstract

This Scoping Report describes the outcome of desk study research and in-country discussions and fact finding in the Low Volume Rural Roads (LVRR), Transport Services (TS) and Road Traffic Safety (RTS) sectors of Sierra Leone and Liberia. In both countries a review is undertaken of recent and current developments in these sectors in order to form the basis of a gap analysis. From this gap analysis a long list of potential ReCAP research projects is developed for each country. These projects are prioritised and a preliminary assessment made of the required duration, staffing and resources needed to implement them. Given the geographical proximity of both countries and the fact that both are recovering from civil war and the Ebola crisis, it is not surprising that the proposed projects for each are very similar.

As far as LVRR projects are concerned these commence with a study of the geographical variability of terrain, geology, soils, drainage and materials in each country, supported by in situ and laboratory testing in order to provide guidance on the variability of subgrade conditions and the suitability of materials for use in road works. The DCP (Dynamic Cone Penetrometer) design method, developed and applied elsewhere by AfCAP, will be trialled in both countries to provide a rapid and low cost means of assessing subgrade strength and investigating pavement layers. There are proposals for trialling the use of alternative road surfacing options by several donor agencies in Liberia. These will be reviewed, a workshop will be held in Monrovia, and a decision made as to whether ReCAP should become involved in additional trials in either or both countries. It is probable, however, that this will be the case, in some form or another, using construction resources provided by feeder road rehabilitation projects in both countries. A Feeder Roads Design Manual will be developed for both countries, building upon the existing Liberia Ministry of Public Works (MPW) manual first, incorporating the outputs from the projects described above, and making maximum use of relevant design manuals developed by AfCAP elsewhere in Africa. These manuals will take account of varying terrain, ground conditions, materials and drainage, and will be regional-specific to each country. A set of revised Specifications will also be developed. These research projects will be developed first in Liberia and then transferred, modified and tailored to suit conditions in Sierra Leone.

Rural access and accessibility to reliable and safe transport services is a significant issue in both countries. There is a general lack of knowledge and data concerning the socio-economic and gender-based needs of access in rural areas and the extent to which current transportation services fulfil these needs. What is known is that motorbike taxis play a major role in rural transportation and that traffic safety is a serious concern with motorbike taxis in both countries. Affordability and accessibility may be important constraints on the utilisation of transport services and it is likely that significant distances are undertaken on foot. Arising from this is the need to carry out research in three main focal areas. The first relates to the transportation needs of rural communities, from a socio-economic and gender-based perspective, and the ways in which footpaths and farm tracks can be improved and strengthened using local materials and skills to make them safer and more reliable. The second concerns the review of motorised transportation services and the ability of these services to accommodate the needs of rural communities at an affordable price. It also includes the design of strategies for strengthening these services and increasing their affordability. The third relates to road traffic safety. A pilot study of road traffic accident data collection should be undertaken, focussing on

motorcycle taxi riders and minivan drivers to record the causes, circumstances and outcomes of traffic accidents in terms of injuries, fatalities, damage to vehicles and road furniture, and the economic costs of temporary road closures caused by accidents. A pilot study will also be undertaken to sensitise and train motorcycle taxi riders in the fundamentals of road safety, demonstrating how rider behaviour and roadworthiness can be controlled and managed so as to minimise the potential for accidents and to mitigate the effects of accidents. A model for training, testing, certification and registration will be developed for the responsible authorities to roll out. These research projects will be undertaken first in Sierra Leone and then transferred, modified and tailored to suit detailed conditions in Liberia. Maximum use will be made of similar studies undertaken elsewhere by AfCAP, particularly in Tanzania.

Key words

Sierra Leone, Liberia, rural roads, transport services, low volume roads, sustainability.

AFRICA COMMUNITY ACCESS PARTNERSHIP (AfCAP) *Safe and sustainable transport for rural communities*

AfCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable transport for rural communities in Africa. The AfCAP partnership supports knowledge sharing between participating countries in order to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources. AfCAP is brought together with the Asia Community Access Partnership (AsCAP) under the Research for Community Access Partnership (ReCAP), managed by Cardno Emerging Markets (UK) Ltd.

See www.AfCAP.org

Acronyms, Units and Currencies

AfCAP	Africa Community Access Partnership
AfDB	African Development Bank
AICD	Africa Infrastructure Country Diagnostic
AIDP	Agriculture Infrastructure Development Project
AMS	Asset Management Strategy, Liberia
ASRP	Agriculture Support Revitalisation Programme, Liberia
AWERE	A West African Response to Ebola (EU)
BWZ	Bundesministerium für Wirtschaftliche Zusammenarbeit
CBO	Community-Based Organisation
CDTS	Capacity Development in the Transport Sector, Liberia
DBST	Double Bituminous Surface Treatment
DCP	Dynamic Cone Penetrometer
DFID	Department for International Development, UK
DHS	Demographic and Health Survey, Liberia
ECOWAS	Economic Community of West African States
EDF	European Development Fund
EIP	Emergency Infrastructure Project, Liberia
ESoL	Engineering Society of Liberia
EU	European Union
FRAMP	Feeder Roads Alternative and Maintenance Programme, Liberia
FRDMS	Feeder Roads Design Manual and Specifications, Liberia
GCP	Growth Consolidation Programme, Sierra Leone
GDP	Gross Domestic Product
GIS	Geographical Information System
GIZ	Gesellschaft für Internationale Zusammenarbeit
GoL	Government of Liberia
GOPA	Gesellschaft für Organisation, Planung und Ausbildung
GTZ	Gesellschaft für Technische Zusammenarbeit
GoL	Government of Liberia
GoSL	Government of Sierra Leone
HDM4	Highway Design and Maintenance 4
HIES	House Income and Expenditure Survey, Liberia
HMMP	Highway Maintenance Management Plan, Liberia
IFAD	International Fund for Agricultural Development
IDA	International Development Association (World Bank)
IDP	Infrastructure Development Project, Sierra Leone (World Bank)
IIU	Infrastructure Implementation Unit, Liberia
ILO	International Labour Organisation
ITPSIP	Integrated Policy, Strategy and Investment Plan, Sierra Leone
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau
LC	Local Council/s, Sierra Leone
LIBRAMP	Liberia Road Asset Management Project
LISGIS	Liberia Institute of Statistics and Geo-Information Services
LRTF	Liberia Reconstruction Trust Fund
LSFRP	Liberian-Swedish Feeder Roads Project
LVR	Low Volume Roads
LVR	Low Volume Rural Roads
MCC	Millennium Challenge Fund
MoA	Ministry of Agriculture, Liberia

MoAFFS	Ministry of Agriculture, Forestry and Food Security, Sierra Leone
MoF	Ministry of Finance, Sierra Leone
MoT	Ministry of Transport, Liberia
MoTA	Ministry of Transport and Aviation, Sierra Leone
MoU	Memorandum of Understanding
MoWHI	Ministry of Works, Housing and Infrastructure, Sierra Leone
MPEA	Ministry of Planning and Economic Affairs, Liberia
MPW	Ministry of Public Works, Liberia
NGO	Non-Government Organisation
NaCSA	National Commission for Social Action, Sierra Leone
NRRFP	National Rural Feeder Roads Policy, Sierra Leone
NRRFP	National Rural Feeder Roads Policy, Sierra Leone
NTMP	National Transport Master Plan, Liberia
OPRC	Output and Performance-based Contract
PCUs	Passenger Car Units
PIU	Project Implementation Unit, Liberia
PPPs	Public Private Partnerships
PRS	Poverty Reduction Strategy, Liberia
RAI	Rural Access Index
ReCAP	Research for Community Access Partnership
RED	Road Economic Decision (model)
RFA	Road Fund Administration, Liberia
RMFA	Road Maintenance Fund Administration, Sierra Leone
RMMS	Road Maintenance Management System
ROMAPS	Roughton International (Road) Maintenance Planning System
RRMU	Rural Road Maintenance Unit, Liberia
RREMP	Rural Road Emergency Maintenance Project, Liberia
RTAs	Road Traffic Accidents
RTS	Road Traffic Safety
SAPEC	Smallholder Agriculture Productivity Enhancement & Commercialisation, Liberia
SCARDEP	Smallholder Commercialisation & Agribusiness Development Project Sierra Leone
SCP	Smallholder Commercialisation Project, Sierra Leone
SFCG	Search for Common Ground, NGO Liberia
SIU	Special Implementation Unit, Liberia
SLCDDP	Sierra Leone Community Driven Development Project
SLIE	Sierra Leone Institute of Engineers
SLRA	Sierra Leone Roads Authority
SLRSA	Sierra Leone Road Safety Authority
STCRSP	Smallholder Tree Crop Restoration Support Programme, Liberia
TIDU	Transport Infrastructure Development Unit, MoTA Sierra Leone
TS	Transport Services
UK	United Kingdom (of Great Britain and Northern Ireland)
UKAid	United Kingdom Aid (Department for International Development, UK)
UL-PIRE	University of Liberia, Pacific Institute for Research and Evaluation
URIRP	Urban and Rural Infrastructure Rehabilitation Project
USAID	United States Aid
USL	University of Sierra Leone
VOCs	Vehicle Operating Costs
VPD	Vehicles Per Day

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1 Introduction

1.1 Background

This Scoping Study report develops a shortlist of recommended research projects in the low volume rural road (LVRR) and transport services (TS) sectors in Sierra Leone and Liberia. Sierra Leone was formally approved as a member at the AfCAP (Africa Community Access Partnership) Steering Committee meeting of November 2015 and an MoU (Memorandum of Understanding) between AfCAP and the Government of Sierra Leone (GoSL), represented by the Sierra Leone Roads Authority (SLRA) was signed on 19 February 2016. The MoU with the Ministry of Public Works (MPW), Government of Liberia (GoL), was signed on 8 July 2016.

On 29 June 2016 Cardno Emerging Markets (UK) Ltd awarded Hearn Geoserve Ltd a contract to carry out a Scoping Study for potential research projects in the rural roads and transport services sectors of Sierra Leone and Liberia. This Scoping Study Report has been prepared as the outcome of four stages in the assessment:

- An Inception stage assessment of desk study data, reported in the project Inception Report (finalised in July 2016)
- A visit to Sierra Leone and Liberia over a two-week period during the first half of August 2016 as a fact-finding and consultative mission
- A two-week period of desk study data compilation and analysis to set out and prioritise potential research projects
- A return visit to Sierra Leone and Liberia at the end of August 2016 to present the findings at Steering Committee workshops in each country
- Finalisation of this Scoping Study with feedback from the two workshops in September 2016.

This Scoping Study is presented in five sections. This section forms the Introduction. Section 2 outlines the objectives and criteria for ReCAP (Research for Community Access Partnership) research. Section 3 describes the background or 'situation analysis' for Sierra Leone and develops the rationale for gap analysis and research project selection, while Section 4 does the same for Liberia. Section 5 outlines the recommended research implementation strategy and indicative resourcing requirements. Note that this is a stand-alone document; there is no need to consult the Inception Report for background.

1.2 Aim and General Approach of this Scoping Study

The aim of this Scoping Study is to identify potential areas of rural road and transport services research, capacity building and knowledge transfer in both countries that could be supported by AfCAP. To achieve this the following activities are to be undertaken:

- Conduct in-country stakeholder consultations
- Compile a list of research themes in rural roads and transport services for each country for possible support by AfCAP
- Assess local capacity to sustain research outcomes and identify capacity building options
- Define a framework within which research projects will contribute to the 'enhancement of rural transport knowledge management, lesson learning and dissemination'.

1.3 Team Composition and Key Stakeholders

The consultant Team Leader appointed is Gareth Hearn. He has been supported by specialist local consultants; Badamasi Savage provided support from Sierra Leone and Joseph Quansah from Liberia. The SLRA and the Liberia MPW provided counterpart staff to understudy the Team Leader and Local Consultant specialists. Tamba Amara of the SLRA and Sumoiwuo Harris from the Liberia MPW were appointed to act as country coordinators for AfCAP projects. Their assistance in the collection of data for this Scoping Study is gratefully acknowledged as are the contributions made by other members of the SLRA, the MPW and other agencies and consultants during meetings held in Freetown and Monrovia.

2 AfCAP Aims, Objectives and Qualifying Criteria for ReCAP projects

The overall aim of the AfCAP programme is to promote safe and sustainable rural access among African member countries through research and knowledge-sharing. By way of background, the text below has been copied from the ReCAP website (<http://www.research4cap.org/SitePages/Home.aspx>).

Transport is fundamental to economic growth and the delivery of basic services. Low volume roads are the principal form of transport in the rural parts of most low-income countries. People require access to reach basic services and all kinds of economic and social opportunities. However, an estimated one billion people live further than 2 km from an all-season road. Isolated communities are often left behind in development. The overall objective of the UKAid-funded Research for Community Access Partnership (ReCAP) is to improve accessibility of the rural poor in Africa and Asia to economic opportunities and social facilities through improvements to infrastructure and transport. The immediate focus is on strengthening the evidence base on more cost effective and reliable low volume road and transport services approaches, thereby influencing policy and practice.

Table 1 summarises the range of subjects that could potentially qualify for funding assistance from AfCAP. This has been used as a guide to the identification and selection of ReCAP opportunities. Given the extent of research and project deliverables achieved from elsewhere in the AfCAP group of countries, it is important to ensure that outputs are shared and built upon, rather than duplicated, and that they are strengthened on a country-by-country basis taking account of country-specific conditions.

Table 1: AfCAP research clusters and themes

Thematic cluster	Themes
1. Infrastructure	1.1 Sustainable and economical provision of infrastructure
	1.2 Optimised use of material resources and environment
	1.3 Effective whole life rural road asset management
	1.4 Defining, measuring and analysing road access
2. Transport services	2.1 Public transport services operation and regulation
	2.2 Motorcycle taxis and intermediate means of transport
	2.3 Rural mobility and access to roads
3. Cross-cutting issues	3.1 Measuring the requirements for, and the benefits of, rural roads and transport services
	3.2 Climate threats, resilience and environmental issues
	3.3 Gender equality, equity and social inclusion
	3.4 Safety and security
	3.5 Horizon scanning and new technologies

3 Sierra Leone Component

3.1 Geography of Sierra Leone

Sierra Leone occupies an area of 71,740km² with a population of approximately 6 million people that is growing currently at 3% per annum. 60% of this population lives in rural areas. The climate is tropical with a rainy season between May and November. The mean annual rainfall is approximately 3000mm and, although predictions vary widely, rainfall is likely to increase in future decades with an increase in seasonal rains. Underlying geology comprises granitic basement rocks and banded greenstones and ironstones associated with the ancient West African Craton. The terrain is mountainous in the east and hilly and low-lying towards the west. Ground conditions vary significantly within the country and broadly comprise rocky terrain in the north and north east, rolling terrain with residual soils and lateritic gravels in the central area and often low-lying sandy and clayey soils in the south. From an engineering perspective, these regional variations pose quite different subgrade and materials availability.



Figure 1: Geography of Sierra Leone, showing towns, provinces and the primary (Class A) and secondary (Class B) road networks

3.2 Recent History, Transport Infrastructure and Society

Sierra Leone is in a phase of post-conflict and post-Ebola recovery. During the 11-year period of civil war between 1991 and 2002, much of the country's infrastructure was intentionally damaged or fell into disrepair. As a result, the country was ranked 50th out of 53 in the Africa Infrastructure Development Index (African Development Bank, AfDB 2011). The Government of Sierra Leone (GoSL) has made infrastructure recovery a priority focus. There is a need to tackle rural isolation, promote community engagement and integrate transport infrastructure networks across the country as well as improving journey times and promoting sustainable transport systems in urban areas, and particularly in Freetown.

In terms of the Human Development Index (Padrosa 2009) Sierra Leone has one of the highest poverty levels in the world, and strengthened and sustainable transport systems are key to livelihood improvement. According to Africa Infrastructure Country Diagnostic (AICD 2011) infrastructure growth between 2003 and 2007 added only 0.5% to per capita growth during the same period. The World Bank Rural Access Index (RAI - percentage of rural population within 2 km of an all-weather road) for Sierra Leone is 65% (2003 data), a figure that is in the higher range of RAI figures for African countries, compared to 61% in Ghana and only 21% in Ethiopia. Despite the relatively high RAI, large parts of the feeder road network, and even the secondary road network, are untraffickable during the wet season.

Sierra Leone was severely impacted by the Ebola outbreak in 2014 and 2015. In the current post-Ebola recovery period a significant proportion of national and international resources are being utilised in 'Support of the President's Delivery Plan', focusing on water supply, health and related infrastructure, and not on roads and transport infrastructure.

Road transport is the most dominant mode of transport and represents about 85% of the entire transport system in Sierra Leone. 95% of the inland transport of passengers and goods is carried out on roads.

3.3 The Sierra Leone Roads Authority and the Management of the National Road Network

Sections 3.3 and 3.4 are based on a combination of desk study and discussions held with road practitioners and other relevant parties in Freetown between 1 August and 3 August and on the 30 August 2016. These meetings are listed in Table 2.

Table 2: Programme of meetings in Freetown

Date	Location	Attendance
1.8.16	Miriam Hotel	Mr Tamba Amara (Chief Engineer, Feeder Roads Development) Mr Badamasi Savage (Consultant and Dean/Lecturer University of Sierra Leone (USL))
1.8.16	Sierra Leone Roads Authority Headquarters	Mr Abdulai Kamara (Director General) Mr Daniel Wisman (Director of Development) Mr Hassan Turay (Director of Administration) Mr Solokor Bockarie (Chief Engineer of Development) Mr Vandy French (Acting Director of Operations) Mr Tamba Amara

Date	Location	Attendance
		Mr Badamasi Savage
1.8.16	Sierra Leone Road Maintenance Fund Administration (RMFA)	Mr Richmond Sesay (Director of Planning, Programmes, Monitoring and Evaluation) Mr Tamba Amara
2.8.16	Ministry of Transport and Aviation (MoTA)	Mr Abu Bakarr Carew (Permanent Secretary) Mr Tamba Amara
2.8.16	MoTA, Transport Infrastructure Development Unit (TIDU)	Hindolo Shiaka (Director) Mr Tamba Amara
2.8.16	Sierra Leone Roads Authority Headquarters	Mr Sidie Jawara (Personnel/Human Resource Manager)
2.8.16	University of Sierra Leone, Dept of Civil Engineering	Mr Obafemi Davies (Head of Department, USL, and Member of Sierra Leone Institute of Engineers (SLIE)) Mr Badamasi Savage Mr Tamba Amara
3.8.16	Sierra Leone Roads Safety Authority (SLRSA)	Dr Sarah Bendu (Executive Director, SLRSA) Mr Tamba Amara
3.8.16	Ministry of Agriculture, Forest and Food Security (SCADEF – Smallholder Commercialisation and Agribusiness Development Project)	Mr Sulaiman Sesay (Project Coordinator) and his colleagues
30.8.16	Sierra Leone Roads Authority Headquarters	Mr George Nyuma (Director of Feeder Roads, SLRA) Mr Badamasi Savage
30.8.16	National Commission for Social Action (NaCSA)	Mr Sorie Turay (Director Admin, HR and Procurement, NaCSA) Mr Sheku Kemokai (Engineer, NaSCA employed on Sierra Leone Community Driven Development Project (SLCDDP)) Mr Tamba Amara

In addition, AfCAP Steering Committee workshops were held at the SLRA Headquarters on 5 August and 30 August. Those in attendance are listed in Table 3.

Table 3: Participants at the Sierra Leone Roads Authority Steering Committee meetings

Name	Designation	Institution	5 August 2016	30 August 2016
Abdulai Kamara	Director General	SLRA		
Hindolo Shiaka	Director	TIDU, MoTA		
Obafemi Davies	Member	SLIE		
Badamasi Savage	Member	USL		
Dr Sarah Bendu	Chief Executive Officer	SLRSA		
Richmond Sesay	Director	RMFA		
Daniel Wiseman	Director of Development	SLRA		
Tamba Amara	Chief Engineer, Feeder Roads Department	SLRA		
Major Thomas Sandy	Acting Director, Safety and Enforcement	SLRSA		
Ibrahim Kebbay	Personal Assistant to Enforcement Director	SLRSA		
Peter Kome	Chief Engineer	SLRA		
Andrew Jusu	Assistant Engineer	SLRA		
Alexander George	Senior Administration Officer	SLRA		
Joice Bangura	Administration Officer	SLRA		
George Nyuma	Director, Feeder Roads Department	SLRA		
Sama Gamanga	Cooperation Secretary	SLRSA		
Fasineh Kamara	Senior Engineer	SLRA		
Samuel Morgan	Transport Economist	MoTA		
Abdul Nasser Fofanah	Project Engineer	SCADEP/SLRA		
Francis Bockarie	Chief Engineer	SLRA		
Memuna Jalloh	Deputy Director General	SLRA		

Note: Green shade indicates attendance; Bold type indicates Steering Committee permanent members

The Sierra Leone Roads Authority (SLRA) was established in 1993 under the SLRA Act of 1992 as part of the Ministry of Works. In 2010 the SLRA became a semi-autonomous authority, though it falls within the general administrative framework of the Ministry of Works, Housing and Infrastructure (MoWHI). The mandate for the SLRA is to build institutional capacity to plan and manage the country's road network in an effective and sustainable way. The Mission Statement of the SLRA, as defined on its website, is to 'provide a safe, reliable and sustainable National Road system for the enhancement of the socio-economic development of the country'. Policy, regulation and safety within the transport sector as a whole is administered by the Ministry of Transport and Aviation (MoTA).

An organogram showing the structure of the SLRA is given in Figure 2.

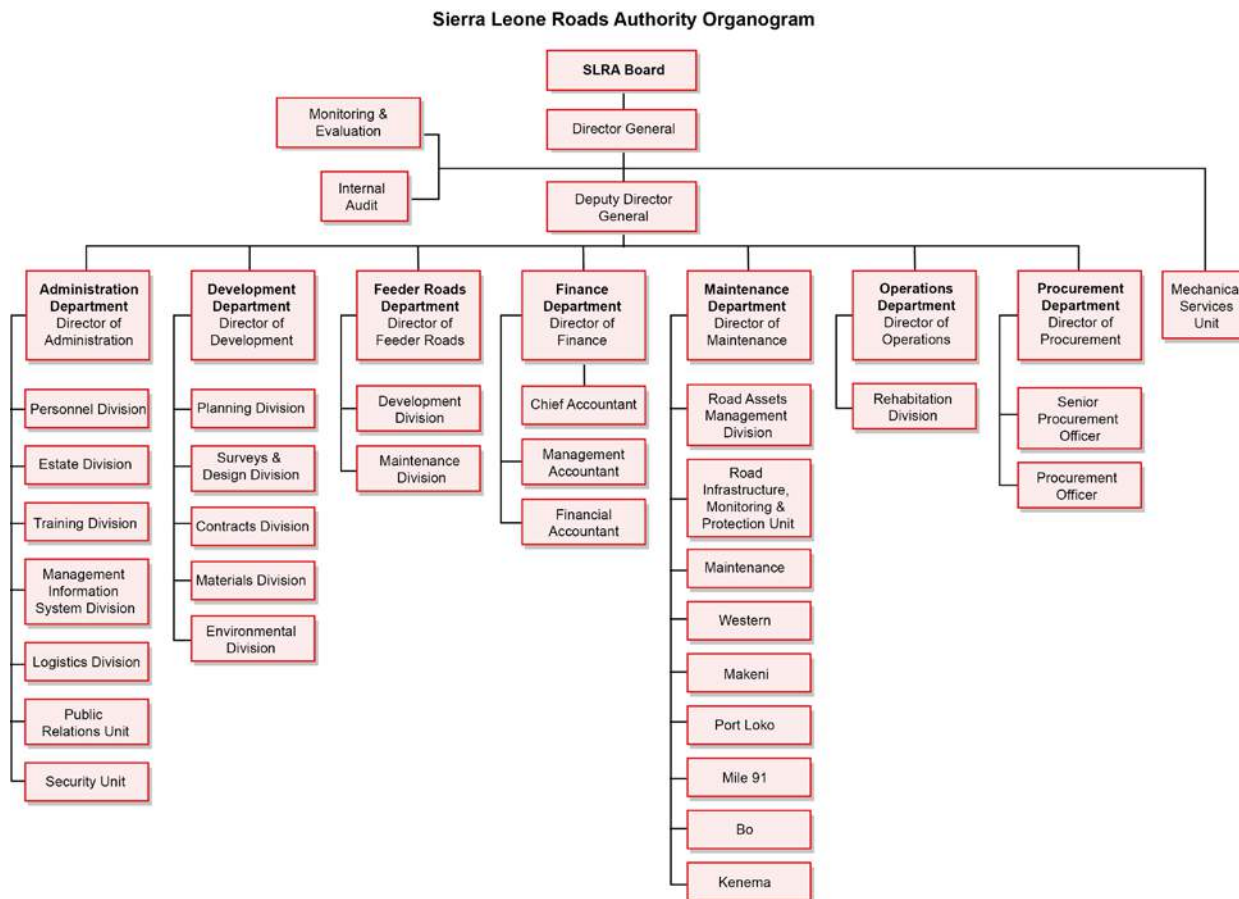


Figure 2: Structure of the Sierra Leone Roads Authority

The SLRA Act makes provision for a 10-member board being the governing body of the Authority. The current structure of the Board of Directors reflects well-balanced interests of various stakeholders, comprising the Chairman, the Director-General of SLRA, the Professional Head of the Ministry of Works, Housing and Infrastructure, a representative of the Sierra Leone Institution of Engineers and Provincial representatives. The day-to-day management, however, rests with the Directorate team, headed by the Director-General as Chief Executive, the Deputy Director-General and seven Departmental Directors.

The SLRA is responsible for the maintenance of the core (primary and secondary) road network. For example, several externally-funded projects have been implemented or commenced in recent years to rehabilitate the Trans African Highway through Sierra Leone, including the 165km Masiaka – Bo highway (EU-funded), the 46km Bo – Bandajuma highway (AfDB-funded) and the 100km Bandajuma – Liberia border highway (EU-funded). According to the 2011 National Rural Feeder Road Policy the SLRA should also be responsible for feeder road rehabilitation although, as described below, a significant proportion of feeder road rehabilitation is now managed through other agencies with varying degrees of advice and supervision from SLRA.

The 19 Local Councils (LCs) have the mandate for the maintenance of rural feeder roads as provided under the Local Government Act of 2004. The NaCSA (National Commission for Social Action) is a semi-autonomous government commission set up to administer post-civil war infrastructure recovery plans, and also plays an important role in the rehabilitation of feeder roads using funds from international donors, such as the World Bank, AfDB, KfW (Kreditanstalt für Wiederaufbau, German Development Bank) and the Islamic Development Bank (IDB). The

Ministry of Agriculture, Forestry and Food Security (MoAFFS), working in connection with the World Bank and IFAD (International Fund for Agricultural Development), for example, is also engaged significantly in feeder road rehabilitation. The SLRA's role in maintenance of feeder roads is largely through the provision of advice and technical support to the LCs; whereas, SLRA's role in development, reconstruction and rehabilitation of feeder roads is to directly manage feeder roads projects or components of the MoAFFS, and provide support to NaCSA projects.

The headquarters of the SLRA Feeder Roads Department in Freetown comprises a Director, a Chief Engineer, two engineers assigned to agricultural feeder roads projects (SCADEP and IFAD, see below) and two assistant engineers. On site there is an engineer based in each of the 13 districts, supported by three superintendents. However, these staff are required to oversee the maintenance of the core road network as well as providing advice to the LCs and the MoAFFS on feeder roads.

The Sierra Leone Road Maintenance Fund Administration (RMFA) was established in December 2011. Although semi-autonomous, it generally falls within the administrative framework of the Ministry of Finance (MoF). According to its website, the Mission Statement of the RMFA is to 'secure and manage the funds in a cost effective manner so as to ensure timely routine and periodic maintenance of the core road network'. However, 20% of the revenue collected by the Road Fund, from fuel levies and vehicle registration and licensing fees, is also provided directly to the LCs for feeder road maintenance. The LCs generally have one engineer per district, though this person is responsible for all engineering works, and not just feeder roads. As a result, there is limited capacity within the LCs to administer road maintenance effectively and spot improvements and periodic maintenance activities are frequently not undertaken.

There are approximately 11,700km of public roads (though quoted figures vary), of which 8,700 km form the National Road System managed by the SLRA (see Table 4). The remainder are local roads and tracks. As of October 2015, the Primary (Class A) road network covered 2,332 km of road of which 925km were sealed. This network is generally in good condition. The Secondary (Class B) road network comprises 2,091 km of road, of which 46km are sealed. Accessibility on the Secondary road network can be quite bad during the rainy season. The Feeder road network covers 4,277km, of which none are sealed, and access during the rainy season can be low or non-existent. In total, only 9% of roads are sealed compared to an Africa average of 18.3%. Approximately 50% of the feeder road network is considered to be in poor condition. Some of the causes of poor accessibility and low traffickability include the effects of landslide debris in some parts of the country, erosion, poor drainage provision and lack of maintenance.

Table 4: The public road network of Sierra Leone

Classification	Description	Network Length	Paved	Surface Condition
A	Primary roads connect the capital with the three provincial capitals, as well as with the district Centres, and also include international routes	2,332 km	925 km	Good in general
B	Secondary roads connect the District Centres, serve as regional main roads and are connectors between primary roads and other secondary roads between centres of production and distribution	2,091 km	46 km	Bad during the rainy season
F (F1, F2 & F3)	Feeder roads	4,277 km	0 km	Inaccessible during the rainy season
	Urban roads	3,000 km	80 km	

The functionality and carriageway specification for the three categories of feeder roads are given in Table 5.

Table 5: Feeder road functionality and cross-section

Feeder Road Category	Function	Carriageway Width (m)	Shoulders	Surfacing	Passenger Car Units (PCUs/day)
F1	Linkage from County HQ towns to Class A or B roads	6m	1m	150mm laterite gravel	50 to 100
F2	Linkage from district HQ towns and villages to Class A or B roads	6m	None	150mm laterite gravel	Up to 50
F3	Community and farm roads	4.5m	None	Gravel or earth surface	Unspecified

Carriageway specifications for Feeder Roads (from National Rural Feeder Roads Policy 2011)

3.4 Current Strategies and Programmes

The National Rural Feeder Roads Policy (NRFRP)

In 2010, GoSL embarked on the elaboration of a strategic plan for rural roads to set out the long term direction and framework for rural development and management and the National Rural Feeder Roads Policy was published in 2011.

The general objectives of the rural feeder roads policy, as stated therein, are to:

- Develop a sustainable rural and feeder road network that is maintained at national standards using the most economic approach
- Contribute to rapid economic growth and structural transformation through facilitating access to rural areas
- Foster good governance and security through involvement of stakeholders/communities
- Increase access to markets
- Use labour based technology where appropriate for the construction, rehab and maintenance of rural feeder roads

The NRFRP describes a wide range of issues concerning the construction, management and maintenance of the feeder road network, identifying weaknesses and developing policy objectives and outline proposals for future strengthening. The NRFRP identifies weak planning and programming, limited institutional capacity and inefficient network management as the main constraints. In addition, the skills levels of engineers employed by local contractors are also considered to be a constraint. The NRFRP made several significant observations and recommendations for the reform and strengthening of the rural feeder roads sector, including the provision of technical support and training by the SLRA to the LCs, ensuring that the technical standards for feeder road works are applied, the preparation of annual maintenance plans and budgets per district and the preservation of feeder roads assets through timely maintenance. It was recommended that one of the criteria for investment decisions should be a comparison of the life cycle costs of different options and it was noted that a fully developed maintenance system is yet to be established at the local level. Another important recommendation was for the National Rural Feeder Roads Committee to ensure that there are always adequate funds for the maintenance of rural feeder roads. It seems that only partial progress has been made in achieving these goals.

In 2013 the GoSL published its Integrated Transport Policy, Strategy and Investment Plan (ITPSIP) as an input to the 'Agenda for Prosperity' 2013-2017. Part of the long term development vision of this Agenda is for 'a middle-income country characterised by, amongst others, a diversified, export-led economy, with local and foreign private sector-led growth, exploiting natural resources responsibly and efficiently. This will be enabled by the right transport, power, information and financial services infrastructure.'

However, the ITPSIP observes several shortcomings and constraints that challenge the development of an effective transportation system, and especially improvements in the road sector. For example, by the end of 2012 neither the SLRA nor the RMFA had in place a maintenance plan ('core road programme'). According to the ITPSIP there is neither a sustainable level of maintenance nor a balance between maintenance, rehabilitation and new road construction.

The ITSP identifies several areas for investment in transport infrastructure and improved management of transport services. Those relevant to the road sector include improved urban and rural mobility, improved public services, increased private sector investment and participation, and the implementation of a number of components of the 2005 Action Plan for SLRA Restructuring that have not yet been carried out.

Restructuring of the road and transport sectors

To all intent and purpose, reform and restructuring in the road sector of Sierra Leone was accomplished over a decade ago, though residual issues in terms of staffing and capacity, engineering implementation and quality control still require attention.

Asset Management

Although the distribution of the primary and secondary road networks is established, there are significant knowledge gaps in relation to the feeder road network and there is no formalised system in place for road asset condition survey other than those carried out on a project-by-project basis with donor funding (see below). The AfCAP-funded study entitled 'Economic Growth through Effective Asset Management' (GEM, GEN2018A) is setting up pilot implementation in the establishment of a system of asset management and condition survey in Zambia, Uganda and Sierra Leone, supported by the provincial government of the Western Cape in South Africa as an example of a functional system for asset management. In Sierra Leone the pilot study area is located in Tonkilili District, and the action plan comprises the following:

- Identify the project road network and prepare road and culvert inventories
- Prepare a map of the project network
- If possible, overlay the road map on the digitised 1:50,000 topographical map of the District
- Print an A0-sized map to be mounted in the District Engineer's Office
- Complete the self-assessment questionnaire
- Identify up to 10 market centres for the social and economic study and plot their locations on the project map
- Complete the social and economic data collection form
- Complete the condition assessment forms for the project network (roads and culverts) based on existing data.

The Inception Report for the implementation of this work was issued in early August 2016 and the outcome should ultimately form the basis of a nation-wide survey. This will lead to the development of an asset maintenance management system that allows the prioritisation and planning of routine and periodic maintenance, as recommended by the NRRFP (above). A roadside socio-economic survey is also being carried out as part of the GEM pilot and this could be usefully interfaced with the proposed rural access diagnostic study described in Section 3.6 below.

Rural (feeder) road maintenance and capacity building

Donor organisations play a key role in the rehabilitation and maintenance of feeder roads. For example, the Infrastructure Development Project (IDP), funded by the World Bank between 2006 and 2013 in conjunction with the SLRA, rehabilitated almost 1,000km of rural roads and led to an increase of over 150% in the number of people with access to an all-weather road (World Bank 2014). There has also been a trend for donors to channel resources through the MoAFFS and NaCSA. For example, between 2008 and 2009, the World Bank assisted the GoSL

(through NaCSA) to set up the Cash for Work Program (World Bank 2012) which involved, *inter alia*, the rehabilitation and maintenance of parts of the feeder road network.

Some of the more significant ongoing projects include:

- IFAD-funded Rehabilitation and Community-Based Poverty Reduction Project (RCPRP) which involves 426km of rehabilitated feeder roads
- AfDB-funded Smallholder Commercialisation Project (SCP) that covers 600km of feeder road rehabilitation
- EU-funded AWERE project (A West African Response to Ebola) with 175km of feeder road rehabilitation.

Although these projects are implemented through the MOAFFS, the SLRA is responsible for the engineering component and supervises the works. The SLRA also carries out training of contractors in labour-based techniques as part of its role on these projects. However, according to the SLRA, SLRA and LC staff require strengthening in the use of labour-based techniques in road rehabilitation and maintenance. The ILO (International Labour Organisation) carried out training in labour-based techniques prior to the civil war, but the benefits of this training were unable to survive the war and have therefore not been sustained. The ILO also produced a feeder roads maintenance manual, but this has become misplaced and therefore no longer used, and a replacement has not been developed. Efforts should be made by SLRA to obtain a copy of the original from the ILO.

The World Bank, with DFID (Department for International Development, UK) support, is in the early stages of implementing SCADEP (Smallholder Commercialisation and Agribusiness Development Project) which will involve the rehabilitation of 770km of feeder roads using OPRC (Output and Performance-based Road Contract) procurement procedures and includes a 5-year maintenance period after completion of the works. The DFID component includes provision for capacity building, including the use of labour-based techniques. Again, although this project is to be implemented through the MOAFFS, the requirement is that the feeder road engineering component is the responsibility of the SLRA.

As described above, NaCSA is implementing feeder roads to support donor-funded agricultural development programmes, and SLRA staff at regional and district level are consulted over specifications and construction supervision. KfW is funding the second phase (2014-2018) of the Pro-Poor Peace for Growth Consolidation Programme (GPC-II). Part of the project is the rehabilitation and spot improvement of feeder roads in three districts (Kailahun, Koinadugu and Kono) in order to provide improved and sustainable access to agricultural areas. Training is carried out in labour-based techniques and Maintenance Committees are established to interface with the LCs to encourage effective long term road maintenance utilising moneys received from the Road Maintenance Fund. According to NaCSA the project is proving very successful and the intention is to extend it to other parts of the feeder roads network.

Discussions held with several parties in Freetown in August 2016 have helped identify several issues that need to be resolved, some of which can be addressed by ReCAP. Perhaps the most important of these is the fact that there is no Feeder Roads Manual available and, as a result, engineers are required to use reference material from different sources, some of which may be applicable, but some not, potentially leading to over-design and under-design. Other comments raised during discussions concerned the lack of 'know-how' among contractors in the construction of embankments and the limited ability to carry out quality control on compaction. Recourse to laboratory testing is infrequent thus limiting the control in the

selection and utilisation of materials in construction. For example, due to their cost, CBR tests are usually only undertaken on the larger projects and subgrade and pavement investigations are often very limited. There is no uniformity in the way in which specifications are interpreted and applied and the lack of easy access to testing facilities means that roads are often rehabilitated without the necessary level of engineering control. The specifications most commonly utilised are similar to those developed by the World Bank and SLRA for the Infrastructure Development Project and those of the EU Delegation. However, these are considered to be too high in terms of materials suitability for some feeder road projects. Regionalisation of the specifications to allow design and construction to be adapted to suit the variable terrain, ground conditions, material and drainage conditions encountered is considered to be a key requirement.

Staff resourcing is also an issue, with only a limited number of qualified and experienced engineers available to design and supervise the works, both within the LCs and the SLRA site staff. The lack of adequate capacity in labour-based techniques amongst contractors and supervision staff is also a contributory factor. Practical guidelines on community-based road maintenance and training in spot improvement techniques have been identified as areas that require strengthening, perhaps in parallel with the preparation of a Maintenance Manual.

The NRFRP noted that there was a need to permit sufficient flexibility to design different sections of road according to differing local environments and needs along the road length. The term environment applies to a wide range of issues, including subgrade, materials, drainage and land use, and discussions with engineering practitioners and university staff in Freetown identified the need to be able to classify and characterise the variability in ground conditions that occurs across the country.

Road surfacing trials

The NRFRP recommended that maximum use is made of local resources in feeder road rehabilitation and maintenance with a view to minimising the whole life costs of road assets. It also recommended the study of alternative road surfacing options and their progressive introduction to feeder roads. With the exception of the use of DBST (Double Bituminous Surface Treatment) on the Mange to Mambolo secondary road, there have been no trials in the use of alternative surfacings and no studies have been carried out as to which might be most suitable in the various 'road environments' of the country.

Transport services

The MoTA is responsible for the provision of transport services and to ensure that the country's infrastructure is fit for purpose. However, there is an urgent need for a comprehensive database covering a range of issues, including traffic flows, axle loads, traffic accidents, rural mobility and the socio-economic and gender-based considerations of rural access. 80% of rural access is by motorbike taxi. An objective of the MoTA is to make transport services more available and affordable with increased national connectivity. The MoTA would like to organise joint venture partnerships between the public and private sectors in the provision of bus services but the condition of the roads is a major constraint.

Road safety

Traffic safety is the dual responsibility of the MoTA and the Sierra Leone Road Safety Authority (SLRSA). The MoTA attaches great importance to traffic safety which they regard as one of the requirements for the operation of an efficient and effective road transport system. A National Road Safety Commission has recently been established with the mandate to develop initiatives for improving road and traffic safety. Nevertheless, traffic safety remains a major concern in both

Freetown and the rural areas of the country, with accidents involving motorcycle taxis the most pressing. There is an urgent need for road safety training among motorcycle taxis especially, as well as rider certification and vehicle registration. Minivans are also frequently involved in road traffic accidents. Seats are often rearranged inside minivans in order to increase capacity, thus overloading vehicles and placing greater numbers of passengers at higher risk. Pedestrian safety is also a major concern in rural areas, with many roadside accidents involving women and children. As well as increased safety awareness, measures to control traffic and pedestrians in roadside villages and towns need to be implemented. There are very limited data available to analyse the circumstances of traffic accidents and no data available to fully assess the impact and costs of traffic accidents, in terms of injury, fatality and damage to property and vehicles.

A number of factors are responsible for the cause and frequency of traffic accidents, including road geometric design, road condition, driver/rider behaviour, vehicle condition and pedestrian awareness. The NRFRP drew attention to these issues and recommended preventative measures to be put in place, including improved road geometry, traffic signage and traffic calming measures. The SLRA is in the process of implementing these recommendations. However, at the West Africa Road Safety Organisation meeting in Freetown in April 2014 the Inspector General of Police stated that *“the major causes of accidents have been over-speeding, driving while under the influence of alcohol or drugs or lack of vehicle maintenance, obstructions on the road, failure to understand and adhere to the general traffic code as most of the drivers in Sierra Leone neither read or write.”*

Rural mobility and community needs for rural transport

According to the SLRA there have been no studies undertaken in this field other than the roadside socio-economic surveys undertaken as part of the baseline studies for individual road projects. Given the decentralised role of road maintenance among the LCs the emphasis is becoming increasingly focused on community participation using labour-based techniques. Mobilisation of communities to take control of sections of feeder roads for maintenance requires an understanding of the issues concerning basic access needs. For example, the use of low-grade farm tracks constructed and maintained by communities using locally available materials would ease pressure on resourcing for feeder roads. In addition, while motorbike taxis represent one of the most important means of motorised rural access, there is also considerable travel undertaken on foot, and especially by women. As far as can be ascertained there have been no studies undertaken to determine how these means of rural access might be strengthened in terms of their permanency and safety.

Minivans also perform an important function in rural access although, according to local sources, the majority of motorised transport (80%) is by motorcycle taxi.

3.5 Gap Analysis and Opportunities for ReCAP in Sierra Leone

This gap analysis is based on the desk study review of available documentation and the outcome of the meeting and discussions held in Freetown outlined in Section 3.4. During the Inception phase of this Scoping Study (see Inception Report, dated 25 July 2016) a desk study gap analysis was undertaken based on information obtained from the Internet and a list of potential research projects was identified. In parallel, but entirely separate from this exercise, the SLRA prepared their own list of projects for consideration. These two lists are compared in Table 6 according to the AfCAP Research thematic clusters and research themes shown in Table 1. Proposed research projects shaded in green are approximately coincident between the SLRA list and the Inception phase list, i.e. both parties identified similar projects. They have potential, therefore, to form part of the final shortlist following the fact-finding scoping visit. As is evident from the table, there are several AfCAP research themes that are not

represented among the nominated projects, including all of those within the Cross-Cutting cluster.

Table 6: Comparison of proposed research projects: Inception phase desk study and SLRA proposals

Thematic cluster	Themes	Inception Phase List of Potential Projects	
		From Sierra Leone Roads Authority	From Project Inception Report
1. Infrastructure	1.1 Sustainable and economical provision of infrastructure	1. Develop Design Manuals and update of specification for rural roads construction / rehabilitation and maintenance	1. The development of design and maintenance manuals and specifications specific to low-volume rural roads
		2. Develop DCP (Dynamic Cone Penetrometer) manual for feeder roads design & appropriate specifications for construction/rehabilitation	2. The use of the DCP-DN pavement design method taking into account local environmental factors and previous AfCAP training initiatives
		3. Training of SLRA and Local Council Engineers in the use of the DCP method for feeder roads design & demonstration	
		4. Use of alternative / non-standard materials for different layers for construction / rehabilitation of feeder / rural roads	3. Improved road maintenance management procedures, including the greater use of local materials and labour-based techniques in construction and maintenance
		5. Study and trial usage of alternative surfacing materials to seal rural roads; and study in to the whole-life sustainability of sealed vs. unsealed options for rehabilitation / construction of feeder / rural roads	4. Whole-life costing and sustainability of sealed versus unsealed roads, and gravel versus earth roads 5. Low-cost and sustainable road surfacing techniques 6. VOCs and road user costs for sealed, gravel and earth roads
		6. Study into axle load control for rural/feeder roads	7. Interface with ECOWAS (Economic Community of West African States) road standards & axle load regulations
		7. Cost - benefit analysis for rehabilitation of rural/feeder roads using different approaches (traditional means of contracting and OPRC approach)	None
		8. Management of roadside and cross-road drainage, prevention of erosion and landslips along roads in mountainous and hilly areas	
	1.2 Optimised use of material resources and environment	Most of the above relate	Most of the above relate
	1.3 Effective whole life rural road asset management	8. Development of a rural road asset management system Most of the above relate	Most of the above relate

Thematic cluster	Themes	Inception Phase List of Potential Projects	
		From Sierra Leone Roads Authority	From Project Inception Report
	1.4 Defining, measuring, analysing road access	None	None
2. Transport services	2.1 Public transport services operation and regulation	9. Rural Sector Services Diagnostic Study	9. Improved rural transport services, both publicly and privately funded and managed 10. Options for increased efficiency of transport services, together with measures to improve traffic and pedestrian safety
	2.2 Motorcycle taxis and intermediate means of transport	None	None
	2.3 Rural mobility and access to roads	9. above relates	9. above relates
3. Cross-cutting issues	3.1 Measuring requirements for, and the benefits of, rural roads and transport services	9. above relates	9. and 10. above relate
	3.2 Climate threats, resilience, environmental issues	None	None
	3.3 Gender equality, equity, social inclusion	9. above relates	9. and 10. above relate
	3.4 Safety and security	None	10. above relates
	3.5 Horizon scanning and new technologies	None	None

Note 1: Green shading indicates approximate coincidence between suggested projects

Note 2: the following SLRA proposed projects do not fit into the above theme breakdown:

- Rehabilitation of dilapidated feeder roads training school (destroyed during the war)
- Development of a Rural Road Research Centre

Following the discussions held in Freetown during early August a revised long list of potential research projects was drawn up. This was based on the Author's own observations plus suggestions by others during the meetings. These potential projects are intended to fill knowledge and technical gaps identified in the review described in Section 3.4 and are outlined in Table 7 against the AfCAP thematic clusters and themes. A priority has been assigned based on perceived need and comments made on the long list during the Steering Committee meetings.

Table 7: Long list of potential research projects in the feeder road engineering and transport services sectors of Sierra Leone

Long list of Potential Projects Following Scoping Study Visit to Sierra Leone			Priority 1 is Highest	
Thematic cluster	Themes	Potential Projects		
1. Infrastructure	1.1 Sustainable and economical provision of infrastructure	1. Classification of soils & engineering characterization across the country – interface with SCADEP <i>Combine remote sensing and fieldwork, and in situ testing in pilot areas.</i>	1	
		2. Development of a DCP design method for gravel roads, including testing of compaction, training of SLRA and LC engineers - interface with SCADEP	1	
		3. Review of alternative low cost road surfacings according to variations in road environment and access engineering need. Possible use of trials – interface with SCADEP <i>Include lab training in the testing of the materials concerned</i>	1	
		4. Whole-life costing study in the use of different surfacing types	1	
		5. Development of design manual for feeder roads. <i>To incorporate output from 1-5 above</i>	1	
		6. Development of specifications for feeder roads to suit ground and materials variability – interface with SCADEP <i>Modifying specifications already in use</i>	1	
		7. Training in labour-based methods for SLRA and Local Council staff, to include spot improvements and maintenance techniques - interface with SCADEP. Prepare Maintenance Manual in parallel <i>SLRA to adopt trainer training to staff and contractors. However, given the ILO work on this, it may not be high AfCAP research priority</i>	2	
		8. Study into axle load control for rural feeder roads <i>More of an issue for Category A and B roads</i>	2	
		9. Monitoring of moisture content in subgrade and pavement <i>Useful, but of limited application</i>	3	
		10. Advice in the application of PMMP (Pavement Maintenance Management Programme), can it be extended to feeder roads? <i>Proprietary software, not really a research project as such</i>	3	
		11. Review of the benefits of OPRC procurement Vs conventional methods <i>This could form a regional assessment, i.e. not confined to Sierra Leone alone</i>	2	
		12. Training of middle level laboratory technicians <i>Could be carried out in connection with 1 & 7 above</i>	3	
		1.2 Optimised use of material resources and environment	13. Training of communities in the maintenance of farm to village and village to roadhead access, using local materials, including block stone paving in the north - interface with SCADEP	2
		1.3 Effective whole life LVRR asset management	<i>This is being piloted through GEN 2018A</i>	3
1.4 Defining, measuring, analysing road access	<i>This could form a component of GEN 2018A</i>	3		

Long list of Potential Projects Following Scoping Study Visit to Sierra Leone			Priority 1 is Highest
Thematic cluster	Themes	Potential Projects	
2. Transport services	2.1 Public transport services operation and regulation	14. Study into the collaboration between public and private provision of bus services, improved frequency and accessibility of bus services and reduced tariffs <i>There is some scope for this, but the majority of rural access is undertaken by motorcycle taxi minivan</i>	2
	2.2 Motorcycle taxis and intermediate means of transport	15. Development of a system of skills training, safety awareness, certification and registration among motorcycle taxi riders to be rolled out by the SLRSA <i>Along the lines of that undertaken in Tanzania (see Section 5.3)</i>	1
		16. Establish a system for comprehensive accident data collection in relation to both motorcycle and minivan accidents, with capacity building in parallel. <i>This to include cause and circumstances of crash, injuries, fatalities and economic losses, to be undertaken in co-ordination with the Police</i>	1
2.3 Rural mobility and access to roads	17. Rural access and transport sector diagnostic study <i>This would form an overarching study to examine strengths, weaknesses and knowledge gaps in rural access and transportation and would include gender and other social issues</i>	1	
3. Cross-cutting issues	3.1 Measuring requirements for, and the benefits of, rural roads and transport services	<i>This is linked to 17 above</i>	3
	3.2 Climate threats, resilience and environmental issues	<i>None have been identified, it is confirmed that flooding, landslide and sediment hazards do not have a significant impact on rural roads. Note that GEN2014C Regional Project on Climate Adaptation (Ethiopia, Mozambique and Ghana) may shed further light on this in terms of potential future impacts</i>	3
	3.3 Gender equality, equity, social inclusion	<i>16. above relates</i>	3
	3.4 Safety and security	18. Public and pedestrian traffic awareness and safety training	1
	3.5 Horizon scanning, new technologies	<i>None known</i>	3

The high priority (Priority 1) projects identified in this table have been analysed in terms of their significance in achieving AfCAP log frame objectives and indicators. It should be noted that these objectives and indicators were devised by AfCAP for reviewing country programme success as a post-implementation tool, and not as a means of assessing the suitability of potential projects. However, the assessment is of value to this scoping study and is shown in Table 8. It is evident from the table that there is potential to have a moderate to high impact on a number of the AFCAP performance indicators.

Table 8: Review of short-listed projects against AfCAP log frame

Form of Assessment	Indicators	Low Volume Rural Road Engineering						Transport Services			
		Materials mapping and classification	DCP Design Method	Trials in the use of alternative surfacings	Whole-life costing of surfacing types	Feeder Roads Design Manual	Feeder Road Specifications	Motorcycle taxi Regulation and training	Accident data collection	Rural access and transport services	Public and pedestrian safety training
IMPACT: Increased LVRR & TS, safe & reliable access, improving livelihoods of the poor, improving economic growth	Impact Indicator 1: Percentage of rural population who live within 2km of an all-season road (RAI – Rural Access index)	These potential projects are unlikely to directly impact the RAI									
	Impact Indicator 2: Rural transport premium (fares per passenger – kilometre on LVRR relative to fares on long distance bus services) NB VOCs – Vehicle Operating Costs	Strengthened LVRR design & specs may lead to reduced VOCs & fares	Potential high impact on VOCs & fares through pavement optimisation	Strengthened LVRR design & specs may lead to reduced VOCs & fares							
OUTCOME: Sustained increase in evidence-base for more cost-effective and reliable LVRR and TS, promoting and influencing policy and practice	Outcome Indicator 1: Partner government and other financiers co-funding research with ReCAP <i>Contribution in kind (K) relates to funding of trial sections, staff-time, dissemination & training. Core contributions (C) relate to funding of research programmes core cost, research contracts, capacity building and knowledge management</i>	K – SLRA & USL staff-time: field work & training, SLRA workshops, eventual SLRA trainer training. Possible funding of surfacing trials by RMFA C – Planned use of SCADEP project for field investigation sites. Possible funding of surfacing trials by SCADEP OTHER – Combined resourcing with proposed ReCAP projects in Liberia						K -SLRSA staff-time, field work & training facilities OTHER – Synergies and combined resourcing with proposed similar ReCAP projects in Liberia			
	Outcome Indicator 2: Concrete examples of change (applied or formally adopted) influenced by ReCAP <i>Includes road programmes that are planned and designed based on ReCAP guidelines. Implementation does not necessarily have to occur during lifespan of ReCAP</i>	The implementation cannot be guaranteed at this stage, but it is assumed that SLRA and SLRSA are committed to formal take-up of planned ReCAP outputs									
	Outcome Indicator 3: Number of citations in academic articles of ReCAP articles and/or working papers, conference papers	It is too early to be able to confirm this at this stage, though it is assumed that peer-reviewed papers will be published and later referred to and made available in open-access format									
OUTPUT 1: Generation, validation and updating of evidence for effective policies and practices to achieve safe, all-season, climate-resilient, equitable and	Output Indicator 1.1 LVRR and TS: Number of peer-reviewed papers generated from ReCAP-supported or related research projects available in open-access format										
	Output Indicator 1.2: ENGINEERING RESEARCH: National policies, manuals guidelines & research outputs incorporated into government specifications & recommended good practice as a result of ReCAP engineering research	It is too early to comment on this at this stage						Not Applicable			
	Output Indicator 1.3: TRANSPORT SERVICES RESEARCH: National policies, regulations and/or practices for rural transport services	Not Applicable						It is too early to comment on this at this stage			

Form of Assessment	Indicators	Low Volume Rural Road Engineering						Transport Services			
		Materials mapping and classification	DCP Design Method	Trials in the use of alternative surfacings	Whole-life costing of surfacing types	Feeder Roads Design Manual	Feeder Road Specifications	Motorcycle taxi Regulation and training	Accident data collection	Rural access and transport services	Public and pedestrian safety training
affordable LVRR and TS	modified or introduced as a result of ReCAP research (incl. road safety and gender)										
	Output Indicator – 1.4: COST-BENEFIT ANALYSIS: Conducted to determine cost-effectiveness of the solutions proposed, conducted on a whole-life cost basis										
OUTPUT 2 Capacity Building The building of sustainable capacity to carry out research on LVRR and TS.	Output Indicator – 2.1: Proportion of research projects undertaken by country-based experts or institutions in leading roles	University of Sierra Leone expert contributions						Potential for SLRSA to lead this research			
	Output Indicator - 2.2: Number of research projects managed through National Research Centres and supported by ReCAP funding for technical assistance & capacity building	There is not yet a Road Research Centre established in Sierra Leone									
	Output Indicator – 2.3: Proportion of research undertaken with female researcher inputs at senior technical level	It is too early to comment on this at this stage, though SLRA and USL do not have senior female researchers able to take on these roles						It is too early to comment on this, though Dr Sarah Bendu would be in overall control of technical inputs from National staff/experts			
OUTPUT 3 Knowledge Generated Evidence-base of LVRR & TS knowledge is widely disseminated & easily accessible by policy makers/practitioners	Output Indicator – 3.1: Research centres in partner countries linked to an electronic repository for rural transport knowledge	There are no Research Centres in the LVRR and Transport Services sector of Sierra Leone as yet, but the requirement will be for the SLRA and the Liberia MPW to share and combine data on projects and programmes as they proceed									
	Output Indicator – 3.2: Recap-generated knowledge presented and discussed at high level international development debates and conferences	It is too early to comment on this at this stage									

	No anticipated impact or significance
	Low – Moderate anticipated impact or significant
	Moderate – High anticipated impact or significance
	High anticipated impact or significance

LVRR – Low Volume Rural Roads; TS – Transport Services

Note: OUTPUT 4: ReCAP Management is not included

3.6 Outline Scoping of ReCAP Research Projects in Sierra Leone

Low Volume Rural Road Engineering

The research projects outlined below are derived from the tabular presentations in Section 3.5. Although they are described separately they are inter-related and contribute to the development of the Feeder Road Design Manual and the revised Specifications. The projects are similar to those proposed for Liberia (Section 4.6) and Section 5 describes how the research in both countries might be best combined and prioritised. *SL* in the project numbering system below indicates Sierra Leone. Implementation of these projects (Section 5.3) will require significant commitment of staff time and resources from SLRA (and SLRSA). Discussion with the SLRA Steering Committee indicated that the SLRA is committed to making these staff and resources available.

SL1. Materials mapping and engineering classification

The purpose of this research is to strengthen the understanding of the way in which terrain, materials and drainage conditions vary across the country and to derive a geological classification, an engineering characterisation of the range of materials likely to be encountered and their likely performance in construction, rehabilitation and maintenance. The intention is to combine remote sensing with field surveys, involving SLRA and University of Sierra Leone (USL) staff and foreign specialists. Elements of the SCADEP road network will be used to derive the field data for calibration. In situ testing of soils, probably using DCP, Mackintosh probe and hand penetrometer, will be carried out and supported by laboratory testing for grading curves and Atterberg Limits. This soils testing would be best undertaken in the SLRA soils laboratory, recently re-equipped with funding from the EU, or in a SCADEP project laboratory. Training in mapping, logging, sampling and testing will be undertaken as the study proceeds.

SL2. Development and application of the DCP design method

SLRA engineers have already taken part in DCP training and it is intended that further AfCAP training is undertaken in Ghana in the use of the DCP. The intention is to use the SCADEP project to apply the DCP as part of subgrade and pavement investigations. Training of SLRA, SCADEP and LC engineers will take place as the study proceeds.

SL3. Trial studies in the use of alternative road surfacings

Projects SL1 and SL2 above will help to inform the analysis of road surfacing alternatives proposed in this study. These trials might include *inter alia* otta seals, cape seals and single surface dressings. Concrete and block paving will also be considered for trialling on sections of steep gradient. It is important to establish the engineering parameters for trial selection, in terms of ground conditions, materials, drainage and traffic, before decisions are made on the choice and locations of any trials. Preliminary discussions have been held with senior staff on SCADEP regarding the opportunities for carrying out these trials on sections of project roads using project resources and technical management from AfCAP. Designs and specifications will be prepared based on the testing of the available surfacing aggregate, surfacing selection criteria, grading, binding specification, preparation of base course, sealing operations and follow-up inspections. Training of laboratory technicians in materials testing would form part of this exercise.

SL4. Whole-life costing study in the use of different surfacing types

The study will utilise the outcome of SL3 above and existing data on the construction, spot improvement, rehabilitation and maintenance costs of earth, gravel and sealed road surfaces

in Sierra Leone. Life cycle analysis will be combined with cost-benefit analysis to determine the most suitable surfacing options for the road environment, maintenance regimes and operational requirements of feeder roads.

SL5. Development of a design manual for feeder roads

The outcome of SL1-4 above will be incorporated into the development of a feeder road design manual. This manual will be divided according to F1, F2 and F3 (and farm access) feeder road categories and will cover route selection, geometric design, subgrade investigation, choice of cross-section, earthworks design (including embankments), drainage design (including cross-drainage), scour protection, pavement investigation, pavement design, surfacing alternatives, alternative technologies and climate change. It will include introductory chapters that describe the Nature and variability of terrain, geology, materials and drainage conditions within the country (based on SL1 above) and will include reference to this geographical variability in each of the engineering sections. The use of *in situ* and laboratory testing will be covered, along with field methods for describing the engineering characteristics of soils. The design manual will recommend optimum routine and periodic maintenance regimes and discuss the scope of maintenance required to maximise road asset management.

SL6. Modification of specifications for feeder roads to suit ground and materials variability

The existing IDP (World Bank 2012) Specifications referred to in Section 3.4 will be modified to supplement the design manual and reflect more closely the material and road environment variability in the country. It will be specific to the feeder road classification and will include sections on, *inter alia*, quality control, site clearance, ground investigation, subgrade preparation, roadbed excavation, borrow area excavation, borrow materials, embankment construction, subbase, roadbase, gravel wearing course, alternative surfacings, structures, testing of materials and workmanship.

Transport Services and Traffic Safety

Feeder road traffic safety appears to be the leading issue that needs to be addressed and it is recommended that this is given priority in AfCAP research. Projects SL7-9 below are inter-related and would all need to be carried out if a rounded and complete study is to be undertaken, thus maximising the potential uptake of the output. These projects will be undertaken in the field in conjunction with the SLRSA, although SLRA staff will also be involved and project management will be implemented through the SLRA. Project SL10 is related to Projects SL7-9 as well but it is intended as a stand-alone study that will provide the basis for more detailed research in the future, for example in terms of specific elements of transport provision. It is important to establish this 'baseline' condition before decisions are made regarding more detailed research interventions. Implementation of these projects (Section 5.3) will require significant commitment of staff time and resources from SLRA (and SLRSA). Discussion with the SLRA Steering Committee indicated that the SLRA is committed to making these staff and resources available.

SL7. Development of a system of skills training, safety awareness, certification and registration of motorcyclists to be rolled out by the SLRSA

This project is devised as a development of AfCAP project TAN2015E, that developed and applied safety training for motorcycle taxi riders in Tanzania (Section 5.2). In order to establish the background to traffic accidents in rural areas, motorcycle taxi riders and minivan drivers will be interviewed to establish their behaviour in relation to road conditions, pedestrian and passenger safety, road signage, speed, alcohol intake, vehicle load and vehicle condition, and any constraints imposed on their ability to drive safely. The project will involve the collection of existing documentation and review of existing set-ups with respect to safety training. It will

review how best to include reference to 1996 Road Traffic Act and associated Regulations in the context of rider behaviour and safety awareness and will develop simple but effective demonstration documentation that helps maximise take-up by motorcycle riders. The training will be undertaken in a pilot area to be selected by the SLRSA using SLRSA facilities and staff. The Bike Riders' Association and their local representatives will need to be engaged fully in this exercise.

The system for motorcycle registration and rider certification created in Tanzania will be reviewed and a suitable model developed for Sierra Leone (see also Section 5.2 of this report).

SL8. Carry out a pilot study to collect more robust accident data

A pilot area will be selected in consultation with SLRSA and the Police in which a comprehensive accident dataset will be collected. This dataset will include reference to the location of accidents, persons and vehicles involved, cause of the accidents, outcome in terms of injuries, fatalities, damage to vehicles and roadside structures, road closures and lessons learnt. It will involve follow-up visits to hospitals to ascertain injuries and the eventual condition of victims. The study will be undertaken with the SLRSA, utilising SLRSA staff and field representatives hired through Village Development Committees in the pilot area(s). These representatives will be trained in the collection of accident data and will work alongside the local traffic police. The outcome of this research will help inform SL7.

SL9. Public and pedestrian traffic awareness and safety training

This study will be undertaken in the same pilot area(s) selected for SL8 and the same staffing can be engaged. The study will determine public awareness of road safety hazards and will ascertain behavioural patterns when pedestrians are exposed to them. The study will determine whether exposure to traffic hazards is biased towards gender or age, and will identify measures that can be taken to enhance traffic hazard awareness and reduce exposure to risk. Simple demonstration and training aids will be developed that can be used to inform pedestrians using classroom workshops. These training aids can then be rolled out to the wider roadside population by the SLRSA. Maximum use will be made of the outputs from a study undertaken by AfCAP in Ghana (GHA2076A) of hazardous traffic hotspots on rural roads (see also Section 5.2 of this report).

SL10. Rural access and transport sector diagnostic study

The purpose of this study is to develop a baseline dataset that allows the analysis of rural access needs, how these needs are met by current modes of transportation and how rural transport can be strengthened by further research and physical interventions. The study will seek to determine the proportion of travel undertaken on foot or by other forms of non-motorised transport compared to that undertaken by motorcycle taxi, yellow taxi or minivan. It will analyse this data according to gender and age bias and will examine safety and reliability, and cost in terms of fares and time spent travelling.

Measures to strengthen basic access, whether it be on foot or by motorcycle will be examined. These will include the use of local materials to construct footbridges and footpaths and the ways in which local materials and local skills can be utilised to construct more reliable all-weather tracks.

The study will be undertaken in two pilot areas; one in the north and the other in the south of the country. Although not representative of the entire country conditions, these pilots will reflect broad effects of more rocky subgrades in the north and sandy subgrades in the south.

4 Liberia Component

4.1 Geography of Liberia

Liberia occupies a land area of 111,370km² and has a population of approximately 3.5 million with an annual population growth rate of 3.7%. The climate is tropical with a rainy season between April and November. The rainy season in Liberia occurs between April and November, with over 5m of rain falling along the coastal areas. Annual totals decrease further inland to approximately 2m in places. The terrain comprises a coastal plain, rolling hills and a mountainous interior, of which the Nimba Mountains are the most noteworthy. Flooding represents a serious hazard in some parts of the country.



Figure 3: Geography of Liberia, showing towns, counties and primary and secondary road networks

4.2 Recent History, Road Transport Infrastructure and Society

Liberia is in a phase of post-conflict recovery which commenced in 2003 following 14 years of civil war. During this period the national road network was left in a severe state of disrepair (Veser 2011). GDP (Gross Domestic Product) had fallen by 90% by the end of the civil war compared to 1980 levels. According to the International Federation of Red Cross and Red Crescent Societies (undated, but probably 2010) 85% of the population of Liberia was

unemployed with most living in poverty. According to 1993 World Bank data the Rural Access Index (RAI) was 66%, i.e. very similar to Sierra Leone.

Following the cessation of the civil war there was a need to strengthen infrastructure in several areas, including rural access, though the focus was on infrastructure in and around Monrovia and the main road corridors to Guinea and Buchanan. In early 2006 the Special Implementation Unit, (SIU), was set up by the World Bank as a Project Implementation Unit (PIU) for IDA (International Development Association) and other donor funds. The SIU consisted of local and international engineers, the latter providing technical assistance and mentoring to the former. This unit was responsible to implement Emergency Infrastructural Projects (EIP). During 2007 and 2008, 620km of emergency rehabilitation of unpaved roads were implemented by the PIU, under the EIP, on the primary and secondary road networks and 27 steel truss bailey-type bridges were supplied to the GoL for strategic river crossings. Prominent among the projects implemented was the rehabilitation of roads between Monrovia and Buchanan, Monrovia and Ganta and Monrovia and White Plains. Other interventions included water supply and sanitation, rehabilitation of port infrastructure and agricultural support through the Agriculture Infrastructure Development Project (AIDP).

In 2009, the World Bank established the Liberia Reconstruction Trust Fund (LRTF), which included funding provided by the World Bank, DFID, Sida (Swiss International Development Agency), KfW, the EU, Norway and Irish Aid. The SIU was replaced with the Infrastructure Implementation Unit (IIU) in 2009 with greater decision-making authority to implement projects funded by the LRTF. The LRTF has funded the Liberia Road Asset Management Project (LIBRAMP) which included rehabilitation of 250km of primary road between Monrovia and the Guinea border using OPRC forms of contract. The Urban and Rural Infrastructure Rehabilitation Project (URIRP) was also funded through the LRTF and included rehabilitation of critical infrastructure, including the Monrovia – Buchanan road corridor. The OPRC programme comprises rehabilitation (3 years), routine maintenance (5 years) and periodic maintenance (2 years) over a 10-year period.

In 2011 the road network comprised 10,664km (AfDB 2013) though it is now probably closer to 11,800km (IIU Concept Note 2016). The Primary network (between Monrovia and the County capitals) comprises 734km of sealed roads and 1,130km of unsealed, mostly gravel, roads. The Secondary and Feeder road network is unsealed and comprises 2,350km and 5,702km of gravel or 'laterite' roads respectively. However, estimates vary and the 2012 National Transport Master Plan (NTMP) describes parts of the road network that effectively remain unmapped. The country was ranked 43rd out of 53 in the Africa Infrastructure Development Index (AfDB 2011).

In the 2000's 10% of GDP was spent on infrastructure, 80% of which was in transport (AICD 2010). However, the condition of the road network varies significantly and poor traffickability and prevented access during the wet season are serious constraints on rural transportation. 60% of the classified road network is considered to be in good or fair condition (AICD 2010) with one third of the network considered to be 'over-engineered' for current traffic volumes that remain depressed in the post-conflict period.

According to AfDB (2013) the road network falls short of the country's needs, both in coverage and quality. Also in 2013, the USAID-supported Millennium Challenge Commission (MCC), carried out a Constraints Analysis for the country and found the constraint of road access to be the main limiting factor in the country's development. Vehicle Operating Costs (VOCs) on unsealed roads are considered to be twice as high in the wet season than they are during the

dry season. Bridges are frequently washed out or rendered impassable and earth roads (referred to in some publications (eg AfDB 2013) as ‘laterite’ roads) are particularly vulnerable during the wet season. According to AfDB (2013) the cost of sealed road construction is 16 times greater than for ‘laterite’ roads, although the annual maintenance costs of ‘laterite’ roads is more than one-third of the initial construction cost. Short-term affordability versus longer-term sustainability is therefore an issue.

During the Ebola crisis of 2014-2015, poor road access proved to be a major constraint on provision of health care. The situation was most acute in Lofa County where numerous communities are cut off from the rest of the country during the wet season. The World Bank-funded Rural Road Emergency Maintenance Project (RREMP) was set up following the Ebola outbreak, focusing on Lofa County, where seven steel truss bridges were constructed to connect population centres with health institutions. Timber carriageways were also built over a total length of 500m in the worst traffickable sections of road.

Several donors are supporting the rehabilitation and maintenance of the primary road network, including the EU, AfDB, World Bank and the Government of China.

4.3 The Ministry of Public Works (MPW) and the management of the National Road Network

Sections 4.3 - 4.6 are based on a combination of desk study and discussions held with road practitioners and other relevant parties in Monrovia between 8 August and 12 August and between 1 and 2 September 2016. These meetings are listed in Table 9.

Table 9: Programme of meetings in Monrovia

Date	Location	Attendance
8.8.16	Ministry of Public Works (MPW), Monrovia	Mr Sumoiwuo Harris (Assistant Minister Rural Development, MPW and AFCAP Steering Committee member)
8.8.16		Mr Delino Bryant (Advisor, Capacity Development in the Transport Sector), Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ) GmbH
8.8.16		Mr Richmond Harding (Project Coordinator, MPW, Fish Town – Harper Road Project)
8.8.16		Mr Belal Hussain (Team Leader, Liberian-Swedish Feeder Roads Project, LSFRP)
2.8.16		Dr Frederick Were-Hihenyi (Team Leader – Institutional Strengthening and Capacity Building, Feeder Roads Alternative Maintenance Program, USAID/Cardno Emerging Markets)
9.8.16		Mr Emmanuel Baker (Deputy Program Director, Infrastructure Implementation Unit (IIU), MPW)
9.8.16		Mr Sumoiwuo Harris Mr Alibaba Kpakolo (Director of Feeder Roads, MPW and AFCAP Steering Committee member) Mr Foday Kamara (President, Association of Liberia Construction Contractors)
9.8.16		Mr Adam Andreski (Team Leader, Technical Support Group, Cardno IT Transport, IIU, MPW)
9.8.16		Ministry of Transport (MoT), Monrovia

Date	Location	Attendance
10.8.16	Ministry of Public Works (MPW), Monrovia	Mr Jackson Paye (Deputy Minister for Rural Development and Community Service, MPW and AfCAP Steering Committee member) Mr Sumoiwuo Harris Ms Margaret Sarish (Assistant Minister Planning and Programming, MPW and AfCAP Steering Committee member) Mr Sundiata Juasemai (Technical Assistant to the Minister, MPW)
10.8.16	Ministry of Public Works (MPW), Monrovia	Mr Thomas Gonkawon (Vice President of ESOL (Engineering Society of Liberia)) Mr Pawon Boayue (Secretary-General of ESOL) Mr Delino Bryant (Treasurer ESOL) Mr Kalifah Fofana (Engineer with ESOL and MPW)
10.8.16	Ministry of Agriculture (MoA), Campus Fendell, Monrovia	Ms Princetta Clinton-Varmah (Project Coordinator, Project Management Unit, MoA and Director of IFAD) Mr Perry Brown (Procurement Officer, IFAD/MoA) Mr Athelston Tambah (Infrastructure Engineer, (Smallholder Agriculture Productivity Enhancement & Commercialisation -SAPEC/MoA) Mr Teakon Williams (Project Coordinator, Agriculture Support Revitalization Project -ASRP/MoA) Mr Samuel Johnson (Irrigation Engineer, ASRP Project Management Unit/ MoA)
10.8.16	Civil Engineering Department, University of Liberia, Fendall Campus, Monrovia	Mr John Boimah (Chairman, Civil Engineering Dept) Mr Charles Carpenter (Lecturer, Civil Engineering Dept)
11.8.16	Ministry of Public Works (MPW), Monrovia	Hon Mr Jude Moore, Minister MPW Mr Jackson Paye Mr Sumoiwuo Harris Mr Sundiata Juasemai
11.8.16	African Development Bank, Liberia Field Office, Old Congo Town, Monrovia	Mr Patrick Hettinger (Senior Country Economist)
12.8.16	Telecon	Mr Andre Human (Resident Engineer, Aurecon)
12.8.16	Millennium Challenge Account (MCA), Mamba Point, Monrovia	Nicholas Dikenah (Monitoring and Evaluation Lead, Millennium Challenge Account, Liberia Set-up Office)
12.8.16	Ministry of Public Works (MPW), Monrovia	Mr Sumoiwuo Harris
1.9.16	Millennium Challenge Account (MCA), Mamba Point, Monrovia	Nicholas Dikenah Bryant Collins (Department of Compact Operations Transportation and Vertical Structures, Millennium Challenge Corporation (MCC) James Andrew (Community Planner, Volpe National Transportation Systems Center, US Department of Transportation) Brian De Chambeau (Community Planner, Volpe National Transportation Systems Center, US Department of Transportation)
2.9.16	Ministry of Public Works, Monrovia	Ursula Hein (Advisor, GIZ, Capacity development in the Transport Sector, Liberia)

Note: All meetings apart from the last were attended by Joseph Quansah, AfCAP local consultant

In addition, an AfCAP Steering Committee meeting was held at the MPW headquarters on 2 September with three of the principal Steering Committee members. The AfCAP Scoping Study

team also attended the Road Transport Infrastructure Partners' Meeting at the MPW headquarters on 1 September 2016 and presented the background to AfCAP and the preliminary shortlist of research projects (Appendix 1). The Author also attended the Feeder Road Partners' Meeting at the MPW on the 2 September 2016.

The Department of Public Works was established in 1928 and later changed to the Ministry of Public Works in 1972. The mandate for the MPW is to *'administer the engineering component of the country in terms of surveying, drafting/designing, construction and supervision, to improve and maintain, direct or by contract all highways, bridges, roads, streets, airport, seaport and all other public infrastructure in the Republic of Liberia.'* In 2007 the MPW merged with the Department of Rural Development. Since 2012 the MPW has received no funds to maintain the feeder road network. The MPW has in the past undertaken force-account road construction but now contracts out all of its work. There is an operational soils and concrete testing laboratory on the premises of the MPW headquarters in Monrovia.

The organogram of the management structure within the MPW is shown in Figure 4. The Department of Rural Development and Community Services is responsible for rural roads, including feeder and farm-to-market roads. The declared objectives of the department are as follows:

- Improvement of service delivery to ensure quality of life in rural areas
- Implementation of a robust development programme to enhance rural transport through improved feeder and farm to market road network
- Support for non-farm economic activities
- Road maintenance skills development of local inhabitants
- Community sensitisation and awareness activities
- Local technology research and development on feeder roads maintenance.

The Feeder Roads Department of the MPW currently has 11 engineers. Six of these are seconded to donor-funded feeder road rehabilitation projects and the remaining five are based in the MPW headquarters in Monrovia.

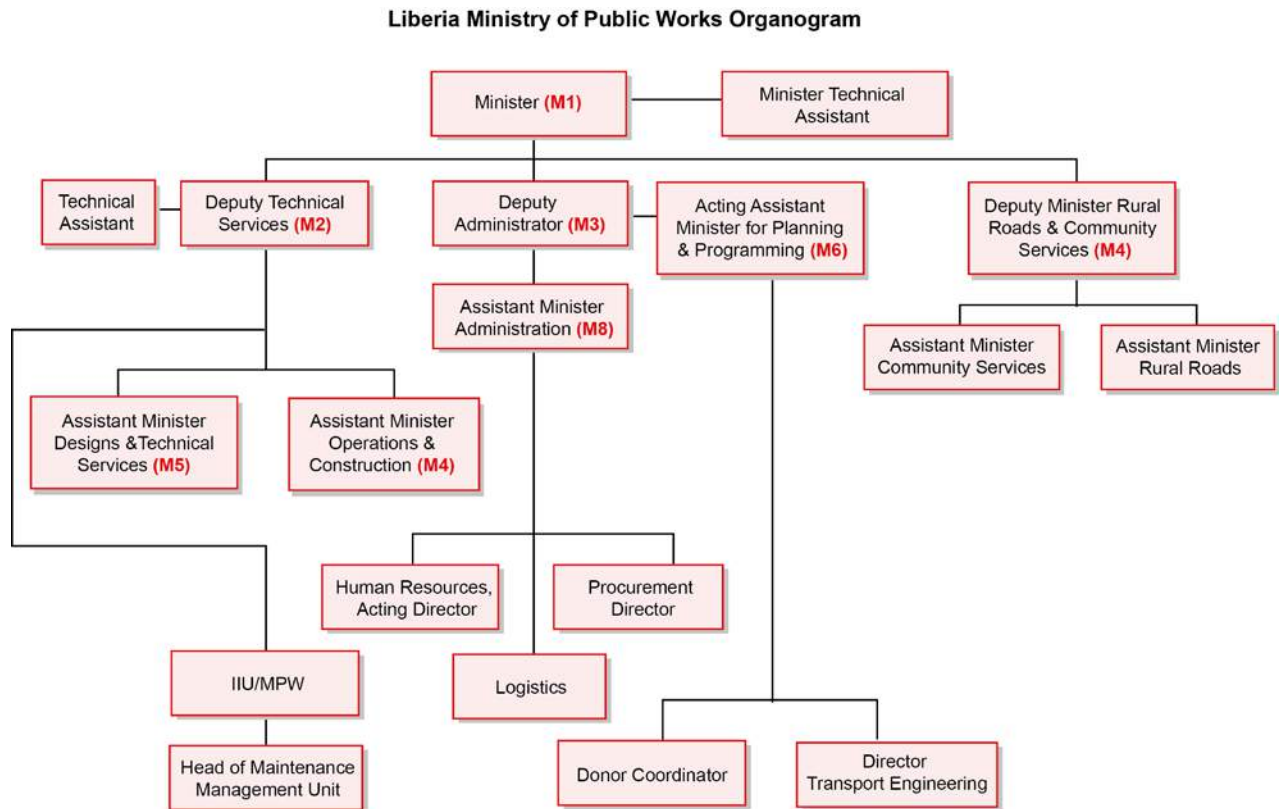


Figure 4: Structure of the Liberia Ministry of Public Works

4.4 Current Strategies and Programmes

GOPA (Gesellschaft für Organisation, Planung und Ausbildung, 2016) summarises the four-pronged approach to capacity development in the transport sector of Liberia, funded by GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit) between 2008 and 2011:

- i) development of a national transport master plan
- ii) transport policy development
- iii) implementation of a Road Maintenance Management System (RMMS)
- iv) training of counterpart organisations.

The National Transport Master Plan was published in 2012; the other three objectives are undergoing continued development.

The 2012 National Transport Master Plan

The National Transport Master Plan (NTMP, GoL 2012) was prepared by Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) and describes the GoL's focus on improving the country's road infrastructure and forms the basis for strategy development and investment planning in the road and transport services sector. The NTMP notes that, in rural areas, passenger-vehicle movements could be as high as 4.43 times 2012 levels by 2030. This is consistent with projected growth rates in GDP of between 6% and 8% per annum over the same period. The NTMP (2012) lists a number of fundamental issues that need to be addressed. These include: the high and often unaffordable fares charged to rural passengers due to high road user costs; a shortage of public transport capacity in Monrovia during peak periods; traffic congestion in Monrovia; a lack of maintenance facilities for public transport vehicles; a poor road safety record; and inadequate axle load control.

The NTMP describes the GoL's Poverty Reduction Strategies (PRS I and II) that have applied to the periods 2008-2011 and 2012-2017 respectively. These PRSs embody four pillars for development, the fourth being the *rehabilitation of infrastructure and the delivery of basic services*. Two components of this pillar are 'roads and bridges' and 'transportation'. The 2009 National Transport Policy and Strategy focused on a number of strategic objectives, including:

- Rehabilitate, reconstruct and construct primary/secondary, feeder and neighbourhood roads
- Improve the transport sector through effective systems and infrastructure for quality service provision
- Improve urban and rural transport
- Build human resource capacity.

The declared PRS II (2012-2017) deliverables specifically include:

- The construction, rehabilitation and maintenance of primary, secondary and urban roads (13,156km in total)
- The construction and rehabilitation of feeder roads (3,367km)
- The construction and maintenance of bridges (165 No)

According to the NTMP, the highest priorities for investment in the road network included the rehabilitation of the all-weather strategic primary network linking Monrovia to the county capitals and the main border points with Sierra Leone, Guinea and Ivory Coast. Furthermore, construction of new road links that could save substantial travel costs should also be prioritised. The NTMP also noted that it is better to spend available funds on speedily restoring some form of all-weather access to as many parts of the country as possible but that the anticipated cost of doing so is unlikely to be met by GoL budgets. Consequently, the Plan recommends that external funds from donors are sought for rehabilitation while government funds, derived from fuel and truck licensing levies, are used to support recurrent maintenance. The NTMP describes how Public-Private Partnerships (PPPs) offer the potential to complement GoL budget sources to help fund these deliverables.

As far as the institutional structure of the road sector is concerned, the NTMP recommended that the IIU of the MPW be developed into a Road Authority and that the MPW and MoT merge into a single Ministry of Transport and Works. In terms of investment planning for future road rehabilitation and maintenance the NTMP recommended the use of the Roughton International Maintenance Planning System (ROMAPS) and the Road Economic Decision model (RED) developed by the World Bank as a simplification of HDM4 (Highway Design and Maintenance 4).

There are several initiatives underway in the road and transport services sector of the country. Principally, these all stem from the recommendations provided in the NTMP and to varying degrees they are structured in such a way as to accommodate and promote the proposed restructuring of the road and transport sectors. Also in 2012, the MPW published its Asset Management Strategy (AMS) that sets out the process for establishing the Road Authority (RA) and the Road Fund Administration (RFA).

Restructuring of the road and transport sectors

The latest proposed structural changes are outlined in the IIU Draft Concept Note dated July 2016 (IIU-Cardno IT Transport 2016) and more or less reflect the recommendations made in the NTMP and the AMS. Through the 'Capacity Development in the Transport Sector' (CDTS) project funded by Bundesministerium für Wirtschaftliche Zusammenarbeit (BWZ) and the 'Build-up Capacity and Preparedness of the Liberia Ministry of Public Works' project funded by the EU with DFID assistance, GIZ is developing protocols for the establishment of a Roads Authority and a Road Fund. The intention is also to decentralise road maintenance to five regions, each comprising three counties. Responsibility for feeder roads will be transferred from the MPW to the counties through the Draft Local Authority Act. MPW resident engineers will be transferred or seconded to county administration to help build capacity. BWZ/GIZ is also assisting the MPW and the Ministry of Transport (MoT) in the establishment of a Road Safety Commission, decentralisation of driver licensing and vehicle registration from Monrovia to the county capitals, the implementation of the axle load law (February 2015) and the ECOWAS Supplementary Agreement of 2012 through the Axle Load Regulation (MoT July 2016). GIZ is also promoting private sector participation in the road sector. The MCC also intends to help implement structural reform and institutional capacity building, the details of which have yet to be determined. The AfDB is also supporting road sector reform and is funding the training of MPW engineers in a range of subjects including transport economics, structural engineering, geotechnical engineering and environmental protection.

Asset management

The World Bank, through the IIU, has completed a road inventory and condition survey. However, this was a fairly rapid exercise and steps are now being taken to improve on the level of detail. The BWZ/GIZ CDTS project has established a Rural Road Maintenance Unit (RRMU) within the MPW as part of the planned decentralisation process. The project is strengthening asset management of the core road network plus 20% of the feeder road network through capacity building in road inventory and condition survey. GIS-based Road Maintenance Management Maps are being developed to help plan maintenance and improvement interventions. The project is also developing a Road Maintenance Manual for sealed and unsealed roads, including feeder roads and National Technical Standards for primary and secondary roads. The intention is also to develop a bridge management system that will be applicable to the entire road network. GIZ has contracted Roughton International through GOPA to develop a Highway Maintenance Management Plan (HMMP) for the entire road network of Liberia using the ROMAPS (Road Asset Management System). The HMMP has the following goals:

- Support the economy and population growth
- Manage the condition and resilience of Liberia's transport system
- Encourage active and sustainable travel
- Improve the connectivity and accessibility of Liberia's transport system
- Improve road safety
- Manage the impact of the transport system on the quality of life.

The Draft HMMP (August 2016) contains recommendations for service and safety inspections regarding pavement, drainage, earthworks, road markings and signage.

The Feeder Roads Alternative and Maintenance Programme (FRAMP), funded by USAID and implemented by Cardno Emerging Markets, is also carrying out road inventory and condition survey. The focus is on feeder roads in four counties: Bong, Grand Bassa, Lofa and Nimba. This information will be used to determine which roads will undergo rehabilitation, trials or routine maintenance (see below). Road inventory and condition survey on the primary road network will

also be undertaken by MCC which is considering establishing Regional Maintenance Centres (RMCs) in five counties (see below).

Rural (feeder) road rehabilitation, maintenance and capacity building

To date, feeder road rehabilitation has been accomplished through funding provided by donor agencies via either the MPW or the Ministry of Agriculture (MoA). The Liberian-Swedish Feeder Roads Project (LSFRP), undertaken by Hifab International, has made substantial progress in the rehabilitation of feeder roads and has developed a Feeder Roads Design Manual and Specification (FRDMS) that has been adopted by the MPW as the official standard (MPW March 2016). A set of 'Best Practice Guidelines' based on the FRDMS has also been produced. Sida has been operating in the feeder roads sector within the MPW since 2009. Due to very limited road sector capacity in the early years, Sida commenced a contractor's prequalification and training programme. Since then, Sida has focused on the rehabilitation of mainly farm to market and farm to village roads, though some funds have been spent on secondary roads, as these are often impassable. The road improvement measures comprise the reshaping of the road formation using materials at the site, the provision of a crown or camber and roadside drainage. The carriageway varies in width between 4m and 6m with a 200mm 'laterite' surface. Because lateritic soils in Liberia are generally suitable for use in road construction, materials are assessed and selected 'by eye', i.e. there is no laboratory testing involved. Concrete has been used over 450m lengths, especially on steep gradients (15-20%), to prevent erosion of the pavement. The Design Manual (MPW 2016) is based primarily on this approach to design and construction. A total of 636km of feeder roads have been rehabilitated in Lofa, Nimba and Bong counties, 580km have undergone routine maintenance and 49km periodic maintenance. The works have been supervised by an NGO (Non-Government Organisation) and the work is carried out using local labour, specifically trained in labour-based techniques.

A further 480km of feeder road rehabilitation is planned for the south and southeast of the country between 2016 and 2020. Construction will take place during the first two years and in the third year the contractor will carry out routine maintenance using labour-based techniques. Some field testing of soils is planned for the next phase, and this could include *in situ* testing, for example using the DCP.

FRAMP is also planning to carry out capacity building in the feeder road sector as part of the planned decentralisation process. This is a 4-year programme to be completed in 2020 with the aim of developing and operating a sustainable road maintenance system at county level. The main activities are as follows:

1. Capacity building in the private sector (consultants, contractors and community-based organisations, CBOs) and public sector (MPW/counties) in road maintenance
2. Implementation of 450km feeder road rehabilitation, mostly farm to market roads, 5m to 5.5m carriageway width. 85km of this rehabilitation have been completed already.
3. Piloting of routine maintenance in Bong, Grand Bassa, Lofa and Nimba Counties. CBOs will be formed, trained and contracted, utilising labour-based techniques. A total of 1300km of feeder roads will be the subject of routine maintenance during the four-year period. During the first year USAID will contribute 100% of the funds to cover routine maintenance costs. This contribution will progressively decrease so that, by the end of the fourth year, GoL will have become responsible for 100%.
4. Implementation of trials in alternative Low Volume Road (LVR) seals (see below).

FRAMP is also using an NGO to supervise the routine maintenance works and has established CBOs to carry out implementation. These CBOs are trained and provided with maintenance tools. Labour-based contractors will be recruited to carry out the periodic maintenance work.

In 2013 the MCC developed Concept Notes for road maintenance in five counties. The intention was to establish RMCs in each but this will be reviewed pending ongoing decentralisation plans. The MCC will fund up to US\$8 million into road maintenance on sections of road where the economic return on the investment is judged to be the greatest. The final figure invested will be equal to the value of matching funds raised by the GoL and the work will only take place if the Axle Load Regulation and the Road Fund are functional and there is a 5-year maintenance plan in place by the GoL. Capacity building will be undertaken in road maintenance techniques, focusing on labour-based methods.

The Ministry of Agriculture is implementing feeder road rehabilitation using funds received from donor agencies, including the AfDB and IFAD. Improved farm to market roads are the focus of the investment and are targeted in the main agricultural production zones. Under the IFAD STCRSP programme (Small-holder Tree Crop Revitalization Support Project), 127km of gravel roads have so far been rehabilitated out of a total 170km using local contractors. The original intention was to rehabilitate 315km of road but the need to follow the MPW Design Manual (MPW 2016) has led to a reduction in affordable construction length within the available budget. An additional 200km of rehabilitation is planned during the next phase. The IFAD programme is also building capacity in seven farmer-based cooperatives to carry out routine maintenance.

Despite these investments, significant problems remain in the serviceability of the road network. During discussions with the MoA it was noted that the benefits of improved farm to market (feeder) roads are nullified if critical access along adjoining sections of secondary or even primary roads is impeded. Furthermore, it is apparent that rehabilitated sections of road or roads that have undergone periodic maintenance can become impassable within a short period of time if not properly maintained. In extreme cases, road pavements have been observed to fail within a single wet season. The wet season in Liberia lasts for over 6 months and even the 'dry season' is prone to rainfall, thus severely restricting the period during which uninterrupted roadworks can be implemented. According to the MoA there needs to be a different approach to feeder road rehabilitation and maintenance. Perhaps an increased focus on 'fit for purpose' would lead to reduced carriageway widths and increased serviceability for the low levels and types of traffic that use feeder roads. Guidance on how to accommodate variable ground and drainage conditions in design and maintenance regimes would also be beneficial. Although the MoA has qualified engineers supervising road works, they are required to follow the existing MPW feeder road design manual which does not provide sufficient detail to account for this variability. Officers within the MPW have indicated that, due to the high cost associated with haulage, it is imperative to make more effective use of materials found locally to the site and this may require an alternative approach to materials specification and their use in construction and maintenance.

Road surfacing trials

According to members of the ESoL (Engineering Society of Liberia) experimentation with the use of chemical seals on scarified gravel pavement surfaces was undertaken in the 1990s using chemicals imported from South Africa. The trials were carried out in Lofa County but proved unsuccessful, due primarily to the effects of heavy rain. Otta seals were also trialled in 2008 or 2009. They performed reasonably well though they suffered from excessive bleeding. More

recently (2016) a chemical stabiliser has been applied to scarified laterite gravel pavement on a section of road in Liberia. It is too early to say whether this will prove successful.

As part of the LSRFP, Sida is trialling the use of concrete and DBST (Double Bituminous Surface Treatment). FRAMP has commissioned a desk study that examined twelve alternative LVR seals (LVR - <50 vpd (vehicles per day) in rural areas), and five have been recommended for trials. Three of these will be ultimately selected. The trials will be carried out over 50km of feeder road in the four counties of Bong, Grand Bassa, Lofa and Nimba. There will also be a 4km trial on a high volume road. The five seal alternatives will comprise:

- Single otta seals
- Sand seals
- Asphalt concrete
- Single surface bituminous surface treatments, and
- Concrete blocks. The concrete blocks will be tested in steep sections (15-20%).

Experimentation will also be made with the use of sand caps. Trial demonstration sections will commence in November 2016 and the intention is to hold a country-level workshop at the same time. CBOs will be contracted to maintain the trial sections during the monitoring period.

The EU is soon to commence a series of road surfacing trials along the Soul Clinic Road in Monrovia, each comprising 300m of surface treatments, including:

- Single surface treatment (spray and chip)
- Double surface treatment with straight-run bitumen
- Otta seal with MC3000 cut-back bitumen and naturally-occurring gravels, and
- Cape seal with straight-run bitumen and crushed rock overlain by two layers of slurry seal.

Although not a surfacing trial *per se*, reconstruction of the road between Sanniquellie and Yekepa in Nimba County has included the use of cement-stabilised sub base in order to reduce the required thickness of asphalt surfacing. The intention was that this would be undertaken as a trial but, due to time constraints, the application has become part of the permanent works.

Transport services

The National Transit Authority is responsible for public services and, according to the MoT, has recently become engaged in the provision of transport services on the feeder road network. Apparently, private sector operators were invited to bid for transport services provision but declined due to problems of road traffickability during the wet season.

The World Bank is to fund, through the MoT, a study on transport services, including buses, minivans, motorbike taxis and yellow taxis. The draft Terms of Reference are in place and include a 'situation analysis' that will result in a proposed strategy for rural mobility, policy and regulations. The programme aims to improve mobility and access to economic and social services to all population groups in four selected counties (Montserrado, Margibi, Bong and Nimba) along the Monrovia-Gbarnga-Ganta and the Ganta-Tapita-Zwedru corridors. The Strategic Plan and Policy for Rural Transport Service will take account of gender and cultural conditions and will address community participation, public and private sector roles in the

provision of motorised and non-motorised transport services. Transport services in the southeast of the country are, presumably, significantly hampered by accessibility and availability issues during the wet season.

Traffic safety

According to the MoT traffic safety is a serious challenge for the government. A study carried out by UL – PIRE Africa (University of Liberia, Pacific Institute for Research and Evaluation Africa, 2014) examined road traffic accidents reported to hospitals in 9 out of the 15 counties of Liberia found that, in 2012, road traffic accidents (RTAs) accounted for 30% of all admissions and that 2/3 of victims were male with the majority in the 15-36 year age group. Accidents involving motorcycles were by far the most prevalent. Despite this study, the authors note that 'Liberia lacks empirical data to inform an effective road safety policy and program'. A study undertaken on behalf of the MoT by the NGO Search for Common ground (SFCG) with support from GIZ (SFCG 2014) involved focus group discussions in Monrovia and 7 other towns as well as household surveys to gauge stakeholder perception and driver/rider perspectives on road and traffic safety. Speeding, drink-driving, driving without license and driving without due care and attention were seen as the most important causes of RTAs. The majority of RTAs were attributed to accidents involving motorcyclists. During the past five months the MoT has been working with the MPW, supported by GIZ, to organise a National Road Safety Commission and carry out road safety awareness training. A training manual in road safety has been developed and pilot training exercises will be implemented in Monrovia and possibly Kakata and Gbarnga on the core road network.

Motorcycle taxis are the overriding consideration in terms of pedestrian and rider safety. Motorcyclists often try to use the same narrow sections of traffickable road and collide as a result. Speeding and sudden breaking of speed are also important causes of accidents. Pedestrian safety awareness is also a significant issue. According to the MPW, accident data are disjointed and few records are kept in hospitals concerning accident victims and outcomes. There is also very limited data covering accident rates and causes rural areas. As far as can be ascertained the risk posed by motorcycle taxi accidents is not being addressed at all. The AfDB is expected to fund a short-term consultancy project to develop protocols in accident data collection and management. As far as can be ascertained, there are no donor-funded projects planned to carry out data collection. The Police are responsible for this activity but their resources to do so are severely over-stretched.

Rural mobility and community needs for rural access

There have been no apparent stand-alone studies of rural mobility and livelihood needs for community access in Liberia. Baseline, roadside household surveys have been carried out prior to the implementation of the Sida-funded LSRP and MoA feeder road rehabilitation projects. The World Bank transport services study referred to above will address gender and socio-economic issues along the primary roads included in the study. The Liberia Institute of Statistics and Geo-Information Services (LISGIS) holds data and analysis derived from the House Income and Expenditure Survey (HIES) that was undertaken in 2014 and is currently being updated. The Demographic and Health Survey (DHS), undertaken 2013, provides further socio-economic data, but both surveys are based on sampled areas of 4000-5000 households. LISGIS has also published a report on the gender dimensions for the 2008 Population and Housing Census. However, these data do not have a rural access focus and there is therefore a knowledge gap in this area. Discussions with the MoA confirmed that needs assessments are undertaken when assessing agricultural access to markets and the targeting of roads for rehabilitation. However, additional mobility and socio-economic studies would assist in prioritisation and justification.

4.5 Gap Analysis and Opportunities for ReCAP in Liberia

Based on the above review and the outcome of the meetings held in Monrovia between 8 and 12 August and 1-2 September 2016, a number of gaps can be identified in the rural roads and transport services sectors of Liberia. Before these are discussed, it is important to itemise below the main issues raised by Hon Minister Mr Jude Moore during a meeting at the MPW on 11 August 2016:

- 1) The Minister was in the southeast of the country recently and observed the problems associated with high rainfall and poor soils. A nationwide study is required on soils types, specifications for borrow material and the use of lateritic materials. Even a rudimentary classification of materials across the country would help immensely.
- 2) Due to heavy rain there is significant gravel loss from Liberia's roads.
- 3) There has been experimentation with low volume seals from S Africa (scarification and chemical mixing). These worked reasonably well but Liberia requires further guidance as to how to treat subgrades and select and improve materials for pavement construction.
- 4) The testing of low volume seals is mostly planned for the central part of the country. There is a need to test these surfacing alternatives in the extreme conditions found in the SE of the country where rains are very heavy and where logging trucks cause severe damage to road pavements.*
- 5) During the peak of the Ebola crisis it was not possible to get access to patients and for blood samples to be transported to health facilities, due to impassable roads.
- 6) Good road serviceability is required for development and agriculture.

* The options for the use of different trials will need to be considered carefully in respect of climate, soils, topography and traffic before a decision is made.

The apparent gaps in knowledge, technique and know-how are described in the remainder of this Section.

Restructuring of the road and transport sectors

This would not ordinarily qualify as an area of ReCAP research, and is anyway amply covered by the existing programmes.

Asset management

There are several programmes in place for the inventory, condition survey and the prioritisation of maintenance management on the road network and it is not recommended that ReCAP becomes involved in this exercise.

Rural (feeder) road rehabilitation, maintenance and capacity building

Capacity building in the use of labour-based construction techniques appears to be well-covered by the existing programmes and there is significant ongoing and planned investment in the decentralisation of road maintenance and the establishment of infrastructure and engineering guidelines and training to support it. However, there are two main fields where research is required in order to provide important information and guidance that appears to be currently missing or weak. The first relates to the engineering characteristics of soils across the country, while the second concerns the strengthening of the FRDMS.

In the first instance, it is apparent that the existing MPW FRDMS requires expansion and strengthening in order to provide guidance on the varying ground conditions encountered along feeder road corridors and how designs should be developed and applied to accommodate them. Furthermore, additional information is required on the design of drainage crossings, subgrade and pavement drainage, the design of earthworks and pavements to suit the specific requirements of the anticipated traffic and the ground conditions encountered. Again, this issue was raised in several meetings during the course of the scoping visit and a revised Manual would benefit from other research activities, including the classification of engineering soils and the use of the DCP-DN design method (above) and the implementation of surfacing trials (below). Note also, that impassable secondary roads commonly prevent rural communities from gaining access to important market and livelihood facilities, and a revised Design Manual extended to secondary roads would also be worthwhile.

In the second instance, there appears to be limited information available concerning the variability in soil types from one region to another and how their engineering characteristics differ. As a result, there is often uncertainty as to how different subgrades will perform and how best to source and utilise the soils that are available. The use of simple in situ testing procedures, such as the DCP would significantly improve assessments of subgrade stability, while the selection of soils samples for laboratory testing would provide further confidence in the engineering classification of soils for use in road construction, rehabilitation and maintenance. The need for research into this field was one of the first points raised by the Minister during the meeting on the 11 August, and the issue was raised in several other meetings during the course of the scoping visit to Liberia.

Road surfacing trials

Considerable research is planned in the use of alternative surfacing trials in the country and a desk study review of trial options has been developed by the FRAMP project. The Minister of the MPW has requested that AfCAP considers implementing trials in the south east of the country in order to determine the most cost-effective surfacing solution for the ground conditions and drainage conditions found there. It is recommended that, before a decision on such trials is taken, a Regional Workshop is held in Monrovia to discuss the details of the intended trials and determine whether any lessons learnt from similar trials in other parts of Africa, including those undertaken by AfCAP, can be usefully incorporated into an integrated and formalised approach.

Transport services

The proposed World Bank study should be able to provide important information and guidance on the transport services needs of rural communities in the study corridors. However, from the information available, this sector requires considerable strengthening and the World Bank project may need to be supplemented, for example by carrying out similar work in the southeast of the country and in Lofa County where access difficulties are particularly severe.

Traffic safety

As described in section 4.4, traffic safety is an important issue that needs urgent attention and there appear to be plans in place to address this. However, motorcycle taxi and pedestrian safety in rural areas is not being adequately addressed and there is an apparent urgent need to collect accident data concerning these risks and to develop rider training and pedestrian awareness campaigns.

Rural mobility and community needs for rural access

Given that the intended decentralisation of feeder road maintenance from the MPW to the counties will require a considerable degree of community participation, it is clear that communities need to be engaged more in the decision-making process and are able to take back ownership and responsibility for rural road maintenance. Ways and means by which rural communities can be encouraged to meaningfully participate in rural road maintenance need to be established and implemented to ensure that this aspect of road maintenance is achievable. Without this, rural inhabitants would rather engage in other occupations from which they earn higher income. Furthermore, there are difficulties and risks associated with basic travel, usually on foot, between farms, villages and agricultural areas and roadside and market locations. It is recommended, therefore, that pilot studies are undertaken to assess the travel and transportation needs of remote rural communities and to determine the socio-economic and gender-specific issues that might apply.

4.6 Outline Scoping of ReCAP Research Projects in Liberia

Table 10 provides a long list of potential projects for ReCAP research based on the above gap analysis and suggestions made during discussions in Monrovia. A priority has been assigned based on perceived importance and following discussions with members of the Steering Committee on 2 September 2016. Projects that have been assigned a Priority 1 status are described below. Note that Priority 2 projects are designated as such because other agencies along with the MPW and MoT are proposing to work in these fields and a review of the outcome is recommended in early 2017 before any decisions are made concerning any ReCAP research investment in Priority 2 area.

Table 10: Long list of potential research projects in the feeder road engineering and transport services sectors of Liberia

Long list of Potential Projects Following Scoping Study Visit to Liberia			Priority 1 is Highest
Thematic cluster	Themes	Potential Projects	
1. Infrastructure	1.1 Sustainable and economical provision of infrastructure	<p>1. Terrain, geology, drainage and materials classification Development of a materials classification system for the country as a whole utilizing remote sensing, existing mapping and targeted field visits to help build up a broad picture. Characterize representative soil profiles in terms of geological and engineering descriptions, carry out in situ testing and sampling for laboratory classification tests. <i>This study could be implemented in conjunction with LSFRP and IFAD/MoA.</i></p>	1
		<p>2. DCP-DN design method for gravel roads Development of a DCP design method for gravel roads that includes quality control, training of MPW & county engineers. <i>Potential interface with LSFRP.</i></p>	1
		<p>3. Regional workshop on the use of alternative surfacing trials The purpose of this workshop, to be held in Monrovia at the earliest opportunity, would be to draw on the experience gained elsewhere in the Sub Saharan Region on the use of alternative road surfacings and the design, application and performance monitoring of trial sections. Regional specialists would be invited to contribute. <i>Trials are planned by the EU and FRAMP and possibly LSFRP. FRAMP is proposing to hold a national (Liberia) workshop in November 2016</i></p>	1

Long list of Potential Projects Following Scoping Study Visit to Liberia			Priority 1 is Highest
Thematic cluster	Themes	Potential Projects	
	1.2 Optimised use of material resources and environment	4. Trialing of road surfacing alternatives in the SE of the country Depending on the outcome of the Regional workshop, and following a review of pavement trials to be undertaken by others, a decision will be made as to how AfCAP might be able to assist. <i>Potential to carry out AfCAP designed, supervised & monitored trials on LSFRP</i>	2
		5. Strengthened Feeder Roads Design Manual The existing MPW Feeder Road Design Manual will be strengthened in terms of regional variations in ground conditions & issues that govern the performance of the works. Furthermore, a number of areas can be strengthened including route selection (for new roads), subgrade investigation & other in situ testing techniques, subgrade improvement, earthwork design, drainage design & sizing of cross-drainage structures, erosion control and construction techniques. Project Nos 1-4 above would contribute to the strengthened manual.	1
		6. Strengthen Specifications for Feeder Roads The existing Specifications will be strengthened, especially with regard to the use classification of subgrade, selection of construction materials, drainage measures, road surfacing and methods of construction.	1
		<i>This will be a direct outcome from the implementation of Project Nos 1, 5 and 6, and possibly 4</i>	
		<i>Not covered, except in terms of surfacing types associated with Project No 4. Asset management studies undertaken by other projects are covering this</i>	
1.3 Effective whole life rural road asset management	1.4 Defining, measuring and analysing road access	7. Rural Mobility and Socio-Economic Baseline Pilot Study Two pilot studies, one in Lofa County, the other in Grand Kru, Maryland or Grand Gedeh to collect data on household dependency on rural access, access requirements for livelihood sustainability and improvement, and health, safety and socio-economic issues concerning prevented or impeded access. Community-based techniques for improving rural access (motorized and non-motorized) will also be examined, including the use of local materials and skills to maintain footpaths, river crossings and tracks. HIES and DHS data may assist. <i>This will help guide the various interventions by other donors in the rural access network & will provide necessary background to Project No 8.</i>	1
		8. Rural Transport Services Pilot Study Two pilot studies, based in the same locations as Project No 7, to review the provision of transport services, public and private, and to develop a model for the cost-effective provision of a strengthened service. <i>The World Bank will address transport services along parts of the primary road network and this study will need to interface closely with the World Bank study. Decentralised licensing and registration systems are being reviewed by GIZ</i>	1
2. Transport services	2.1 Public transport services operation and regulation	9. Development of a system of skills training, safety awareness, certification and registration among motorcycle taxi operators <i>GIZ is developing materials for motorcycle safety training that will be trialed through pilot training exercises. It is recommended that the outcome of this intervention is reviewed before a decision is made to invest in AfCAP research.</i>	2
	2.2 Motorcycle taxis & intermediate means of transport	<i>Project No 8 relates</i>	
	2.3 Rural mobility		

Long list of Potential Projects Following Scoping Study Visit to Liberia			Priority 1 is Highest
Thematic cluster	Themes	Potential Projects	
	and access to roads		
3. Cross-cutting issues	3.1 Measuring requirements for, & the benefits of, rural roads and transport services	None	
	3.2 Climate threats, resilience and environmental issues	<i>The main climate threat to the road network is river flooding. This will be covered under Project No 6. NB GEN2014C Regional Project on Climate Adaptation may shed further light on this in terms of potential future impacts. The Inception Report raised the potential environmental issue of mining legacy, but this is apparently not a significant issue.</i>	
	3.3 Gender equality, equity & social inclusion	None	
	3.4 Safety and security	10. Data collection on road traffic accidents in rural areas <i>The AfDB is to fund a short consultancy to develop protocols for accident data collection and management, though it is not clear what the ToR comprises and how relevant it will be to rural access. The case for carrying out an AfCAP study should be reviewed later. Pedestrian safety is an important concern in rural areas. It is recommended that Project No 7 includes consideration of this issue.</i>	2
	3.5 Horizon scanning and new technologies	None	

L1 Construction materials classification

This will commence with a desk study to compile all available data on soil types across the country¹. It will utilise published geological and topographical maps and will examine the use of satellite imagery to assist in the classification of the terrain into geo-mapping units in order to provide a rationale for classifying soil types. Targeted fieldwork will then be carried out to log soil profiles exposed in roadside cuttings and to classify them in terms of engineering geology. Representative samples will be taken for laboratory classification tests and CBRs (California Bearing Ratios). In situ tests using a DCP and a Mackintosh Probe will be used to help determine undrained shear strength in the field. The performance of the various material classes will be examined in constructed roads for calibration purposes. It is envisaged that this study will be undertaken in collaboration with LSFRP. The MPW has an operational soils laboratory in Monrovia that is capable of carrying out grading analysis, Atterberg Limit tests, CBRs, moisture content and in situ density, among others. The MPW is in the process of developing an MoU with the University of Liberia for use of their soils laboratory. Phase 3 of the LSFRP also intends to have operational a mobile soils laboratory.

L2 DCP-DN design method for gravel roads

The use of the DCP as a replacement or supporting technique for the CBR will be examined by building on AfCAP experience in Ghana (see Section 5.2). The outcome will form the basis of a

¹ The Ministry of Planning and Economic Affairs (MPEA) published a 'Planning and Development Atlas' in 1982 which provides useful background on topography, geology and soils, as well as other geographical data

design report, the output from which will be incorporated into the revised Feeder Roads Design Manual (Project No L5).

L3 Workshop on alternative surfacing trials

Although FRAMP is proposing to carry out a workshop to discuss the design and implementation of pavement trials in the Autumn of 2016, it is recommended that an AfCAP-driven regional workshop is held in Monrovia, organised through the MPW, to review and discuss experience gained in the use of alternative surfacing trials from around the Continent. Experience gained through AfCAP research in the use of alternative surfacings from Mozambique, Ethiopia, Kenya and elsewhere will be reviewed and the proposals for research trials in Liberia to be undertaken by FRAMP, the EU and others will be discussed in the light of this experience. Members of the SLRA AfCAP Steering Committee in Sierra Leone will attend. A workshop report will be prepared for the benefit of the MPW. The option for carrying out AfCAP-funded research trials in the southeast of the country in possible collaboration with LSFRP will be reviewed as part of an integrated approach to the implementation of pavement trials in the country.

L5 Strengthened feeder roads Design Manual

The existing Feeder Roads Design Manual (MPW 2016) will be expanded and strengthened in terms of its technical coverage and geographical representation. It will incorporate the outcome of the field investigations and outputs derived from Projects L1-3 and will be developed in conjunction with the implementation of Phase 3 of LSFRP. The contents of the Manual are expected to include the following:

- Road Network classification
- Policy and legislative controls
- Design parameters
- Geometric design standards
- Route selection for new road construction
- Geological and engineering classification of materials and their geographical distribution
- Methods and standards for in situ and laboratory testing of materials, subgrade and pavement layers
- Earthworks design
- Subgrade improvement
- Pavement design
- Surfacing options
- Cement stabilisation
- Complimentary interventions
- Drainage and erosion control
- Water crossing and associated structures
- Sizing of culverts
- Road furniture and signage

L6 Strengthened Specifications for feeder roads

In order to support the revision to the Feeder Roads Design Manual, the Specifications will be expanded, and will include, *inter alia*:

- Methods of measurement

- Site clearance
- Drainage structures
- Earthworks and materials handling
- Subgrade and fill specifications
- Compaction
- Sub base, base course and gravel wearing course
- Bituminous surfacings
- Rigid pavements and alternative compositions
- Structures
- Ancillary works
- Testing materials, quality control and workmanship

In parallel with the Design Manual, these Specifications will reflect the broad variability in terrain, ground conditions, drainage and materials across the country.

L7 Rural mobility and socio-economic baseline pilot study

Two pilot studies, one in Lofa County, the other in Grand Kru, Maryland or Grand Gedeh will be undertaken to collect data on household dependency on rural access, access requirements for livelihood sustainability and improvement, and health, safety and socio-economic issues concerning prevented or impeded access. The socio-economic datasets held by LISGIS (Liberia Institute of Statistics and Geo-Information Services) will be interrogated for supporting information. Community-based techniques for improving rural access (motorized and non-motorized) will also be examined, including the use of timber bridges and sourcing of suitable local materials. The AfCAP pilot study on first mile transport challenges in Kenya (AfCAP GEN/147) and Tanzania (TAN2015C) provide useful illustrations of some of the work required (see Section 5.2).

L8 Rural Transport Services Pilot Study

Following on from Project No 7, two pilot studies will be undertaken to assess how the needs of the rural communities can be best met through the provision of strengthened transport services, through both private and public sector participation. However, before the details of this study can be confirmed, it will first be necessary to examine the proposed scope of the World Bank Strategic Plan and Policy for Rural Transport Services to ensure that AfCAP research is complimentary and is able to contribute information effectively.

During the meeting held on 11 August 2016 with the Hon Minister Mr Moore and his colleagues the capacity of the Ministry, and in particular the Feeder Roads Department, to staff and provide logistical resourcing for these projects was discussed. Mr Moore confirmed that the MPW would strive to make the resources available but would not be able to guarantee this until the detailed requirements were made known.

5 Proposed Implementation and Resourcing Strategy for ReCAP Research

5.1 Introduction

As can be seen from Sections 3 and 4, Sierra Leone and Liberia experience constraints in the rural roads and transport services sectors that are broadly similar. Both countries have similar climatic regimes and underlying geology and both countries accuse the other of having the wettest capital cities in the world. The lateritic gravels that are found in both countries are used extensively for gravel road pavements, but the tropical climate under which these soils formed is also responsible for the erosion and failure of pavements constructed from them, due to heavy rainfall and high water tables. The rehabilitation and maintenance of rural roads in both countries are impacted by these natural conditions and also by limited internally-generated funds and shortages of experienced staff.

As far as transport services are concerned, both countries suffer from rural access difficulties, limited and unreliable bus services and a local transportation sector that is dominated in the rural areas by the use of motorcycle taxis. Traffic and pedestrian safety is a major issue in both countries, and especially in relation to motorcycle taxis.

It is not surprising therefore that many of the opportunities for ReCAP research to provide meaningful support in both the rural roads and transport services sectors are very similar, if not identical. The 'flow' of priority research projects identified for each country in the Low Volume Rural Road (LVRR), Transport Services (TS) and Road Traffic Safety (RTS) sectors is shown in Figures 5 and 6. These diagrams indicate how certain research themes are common to both countries. To a large extent, they can be developed collectively for both countries and then made country-specific in the detail. This is the case for both the LVRR, TS and RTS projects.

5.2 Recommended Implementation Strategy

Between Sierra Leone and Liberia

For a number of reasons there are advantages in developing research projects in one or other of the two countries and then applying them, with necessary modification to the other. These advantages include:

- The avoidance of duplicated effort
- A reduction in the demands imposed on staffing and logistical resources to implement the projects in each country
- The opportunity to design the implementation to accommodate the progress and outcome of other related projects that are either planned or ongoing.

The last bullet point above refers to the fact that, in Liberia, it is preferable to wait until studies and programmes carried out by other agencies are formalised and concluded before a decision is made as to whether ReCAP research is required to fill any gaps. There are World Bank, AfDB, GIZ and MCC initiatives that are currently being formulated and it is likely that more will be known about the details of their scope by the end of 2016.

Possible AfCAP/ReCAP Research Projects
Engineering Component

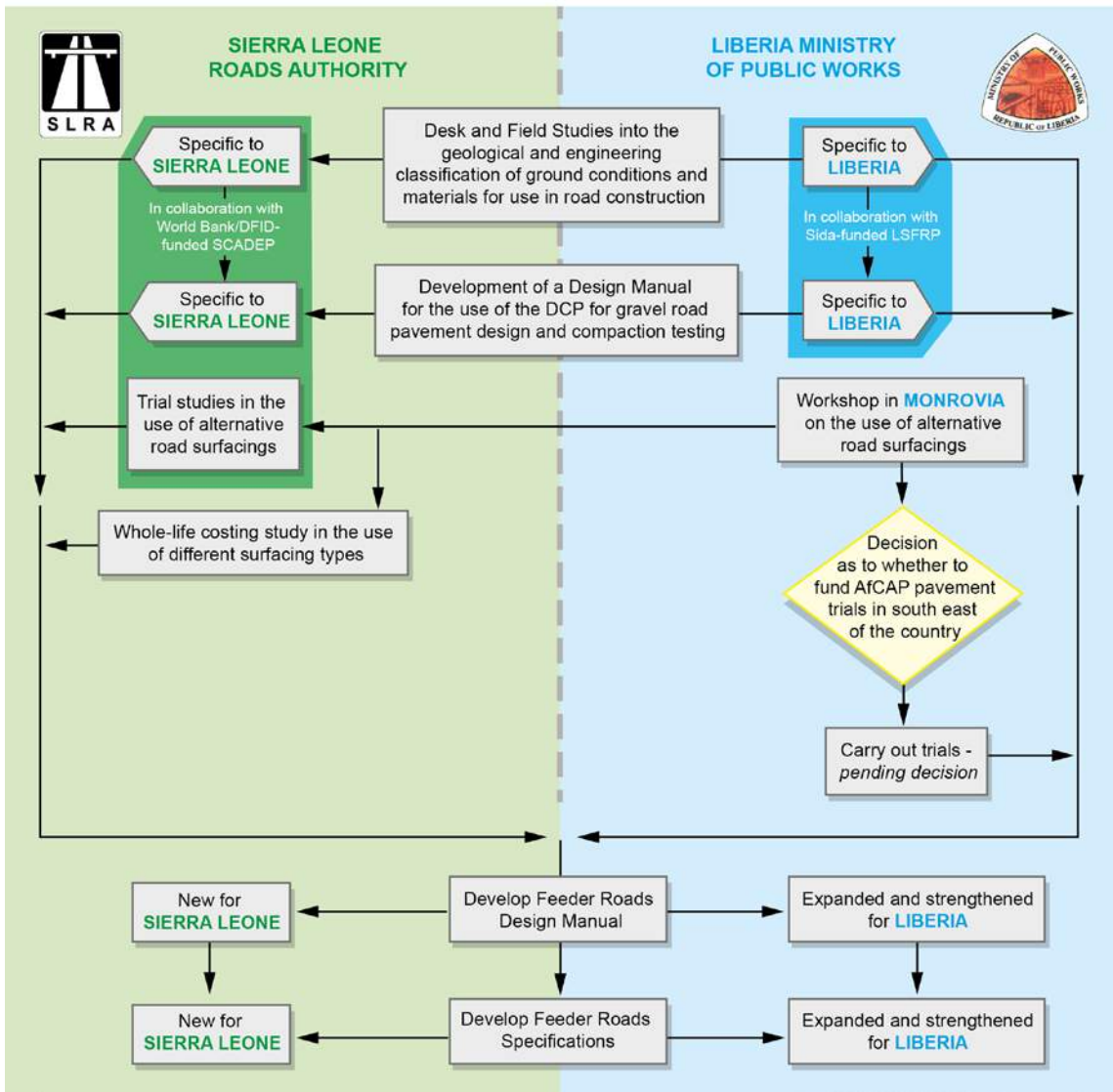


Figure 5: Flow diagram of potential research projects in the LVRR engineering sector

Possible AfCAP/ReCAP Research Projects Transport Services & Traffic Safety Component

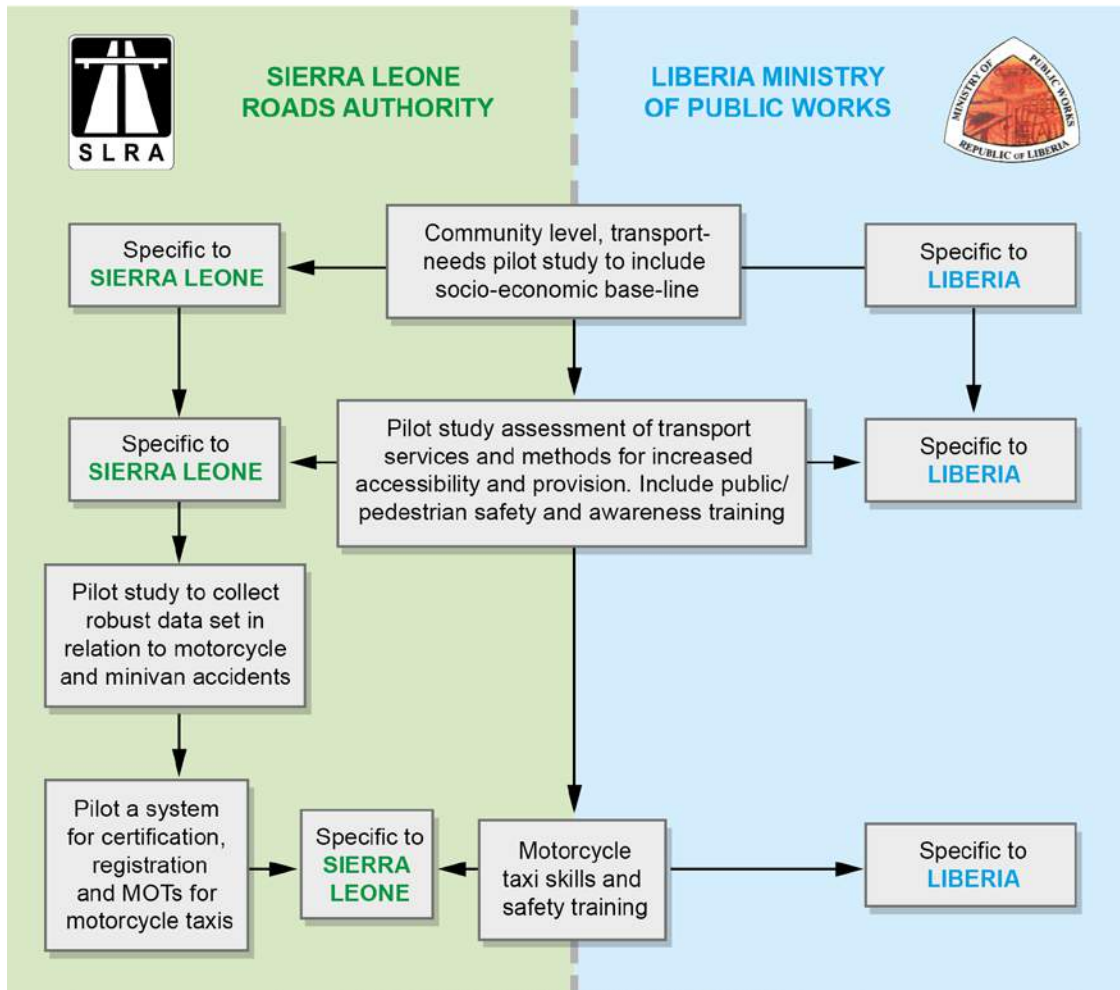


Figure 6: Flow diagram of potential research projects in the transport services and road traffic safety sectors

In view of the above, it is recommended that the LVRR engineering projects in Liberia (L1-6) are undertaken first and then transferred to Sierra Leone for modification and tailoring to meet the specific needs of the SLRA and the environmental conditions of the country. The reason for this choice is the fact that the MPW in Liberia already has a Design Manual and a Specification for feeder roads and is therefore one step ahead. Possible exceptions to this include Project L1 that could be run coincidentally in both countries by the same team or the timing could be staggered to pose less of a demand on staffing and logistical resources in either country. Another complication relates to the implementation of surfacing trials. As discussed in Section 3, SCADEP offers the possible opportunity to implement surfacing trials but contractual arrangements will need to be in place sooner rather than later as the DFID funding component needs to be drawn down by the end of 2018. It may be necessary therefore to press ahead with the decision-making over the use of trials in Sierra Leone once the Monrovia workshop is complete rather than after the performance of the Liberian trials are known.

As far as the TS and RTS projects are concerned, it is recommended that these are undertaken in Sierra Leone first (SL7-10) and then transferred to Liberia for modification and tailoring. The reasoning behind this is that there has been no apparent work carried out in any of the recommended fields of study in Sierra Leone, whereas in Liberia the situation is a little more complicated due to projects already underway or proposed by other agencies. By working in Sierra Leone first it will allow the developing situation in Liberia to be reviewed before the details of recap requirements can be confirmed. Projects L7 and L8 in Liberia should be undertaken in parallel with SL10 in Sierra Leone.






Between Sierra Leone, Liberia, West Africa and the AfCAP region as a whole



Sections 3 and 4 make reference in several places to other projects that have been or are being implemented in other parts of West Africa (namely Ghana) and the AfCAP region as a whole. It is important to ensure that the outcomes and outputs from these other projects are taken into account in a timely and cost-effective manner. As far as projects completed or ongoing in Ghana are concerned, the following should be able to provide important contributions to AfCAP research in Sierra Leone and Liberia, either in terms of background information, technique and methodology or training materials and capacity building:

- GHA2054A Training and application of the DCP-DN pavement design manual in Ghana
- GHA2054B Training in the DCP Method for Sierra Leone participants
- GHA2065A Alternative surfacing for steep hill sections in Ghana – Phase 1
- GHA2076A Identification of hazardous sites (*road traffic accidents*) and the recommendation of remedial measures on selected rural roads.

Table 11 provides further guidance on AfCAP projects, either complete or ongoing that are considered relevant to the potential projects in Sierra Leone and Liberia, identified in Sections 3 and 4.

Table 11: A selection of previous and ongoing AfCAP projects of potential significance to the proposed Sierra Leone and Liberia research projects

Sierra Leone Projects	Liberia Projects	Selected Relevant AfCAP Projects
SL1 and L1 Classification of soils and engineering characterization across the country 		None specifically, though Design Manuals produced for several East African countries (see below) contain information on the engineering properties of tropical soils as does GEN/124 Use of laterites in road pavements
SL2 and L2 Development of a DCP design manual for gravel roads, including testing of compacted pavement layers 		GHA2054 Training in DCP method (Ghana) GHA2054B Training in the DCP method for Sierra Leone participants (Ghana) RAF2069A Design Manual for LVSRs using the DCP design Method (Regional) – ongoing. No reference MAL2007B Guideline for compaction quality control on LVRs using the DCP (Malawi) MOZ/001/G Back analysis of previous constructed low volume rural roads in Mozambique
SL3 Trial studies in the use of alternative road surfacings	L3 Workshop on the use of alternative surfacing trials	GHA2065A Alternative surfacing for steep hill sections in Ghana – Phase 1 KEN2043C Monitoring and evaluation of low-volume roads trial sections (Kenya) RAF2069A Regional back analysis of past LVSRs (Regional) – ongoing. No reference ETH/005/A Development of pavement design standards for low volume roads in Ethiopia (includes otta seals) The design, construction and maintenance of otta seals, Ministry of Works, Transport and Communications, Republic of Botswana (NB not AfCAP) Best practice manual for thin bituminous surfacings, Ethiopian Roads Authority, funded by AfCAP GEN/099 Low volume rural road surfacing and pavements: a guide to good practice TAN/008 Design, Construction and Monitoring of Demonstration Sites for District Roads in Tanzania
SL4 Whole-life costing study in the use of different surfacing types		None, though some relevant information in the above reports, and some discussion is provided in the Cardno (2016) Desk Study for surfacing trials for FRAMP (not AfCAP)
SL5 and L5 Feeder Roads Design Manual (strengthened for Liberia, new for Sierra Leone) 		ETH/2052A Design manual for low volume roads (Ethiopia) TAN2031B Review of Final Draft of the low volume road design manual, Tanzania (GEN2031A) – ongoing. No reference KEN2039C Review of Final Draft of the low volume road design manual, Kenya – ongoing. No reference
SL6 and L6 Strengthened Specifications for feeder roads 		MAL/016 Performance review of design standards and technical specifications for low volume sealed roads in Malawi Standard technical specifications and methods of measurement for roadworks, Ethiopian Roads Authority, funded by AfCAP
SL7 and L9 Development of a system of skills training, safety awareness, certification and registration of motorcyclists 		TAN2015E Tanzania motorcycle taxi driver training assessment and development of appropriate training curriculum TAN2015G Road traffic injury on rural roads in Tanzania: investigations into the opportunities to improve safety through regulation and self-regulation of motorcycle taxi associations TAN2015G Opportunities to improve road safety through 'Boda-

Sierra Leone Projects	Liberia Projects	Selected Relevant AfCAP Projects
		Boda' associations in Tanzania
SL8 and L10 Carry out a pilot study to collect more robust accident data 		TAN2015B Road traffic injury on rural roads in Tanzania (focus on motorcycle accidents in remote areas)
		GHA2076A Identification of hazardous sites & recommendations for remedial measures on selected rural roads
		TAN2015B The magnitude and characteristics of road traffic injury in Kilolo District, Tanzania
		TAN/115 Road traffic injury on rural roads in Tanzania: A study to determine the causes and circumstances of motorcycle crashes on low-volume rural roads
SL9 Public and pedestrian traffic awareness and safety training 		None
SL10 Rural access and transport sector diagnostic study	L7 Rural Mobility and Socio-Economic Baseline Pilot Study	GEN2033A RAI (Rural Access Index) and development of a GIS (Geographical Information System) and satellite imagery methodology (Global and managed by World Bank)
		TAN2015D Learning with older people about their transport and mobility problems in rural Tanzania
	L8 Rural Transport Services Pilot Study	TAN2015A Quality assurance for rural transport services project cluster in Tanzania
		GEN/147 Pilot study on first mile transport challenges in the onion smallholder sector (Kenya)
		TAN2015C Study on first mile transport challenges for smallholder farmers in the hinterland of the Iringa-Kilola road, Tanzania
		TAN2015F Baseline study on rural transport service indicators in the Iringa-Kilola road catchment area (Tanzania)






Note: 1 Green arrow indicates transfer from Liberia to Sierra Leone with necessary modification and tailoring to cater for specific country and district requirements. Amber arrow and italicised text indicate transfer from Sierra Leone to Liberia with necessary modification and tailoring to cater for specific country and county requirements, but transfer is dependent upon outcome of studies undertaken by other donors/agencies in Liberia


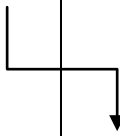
Note 2: The list of potentially relevant AfCAP projects may not be comprehensive and there will be several relevant non-AfCAP sources that will need to be accessed during project implementation

5.3 Outline Resourcing Strategy

An outline resourcing strategy is shown in Table 12. It is based on the distribution of research centres and the transfer and modification of outputs as indicated in Figures 5 and 6 and Table 11. It is emphasised that the resourcing requirements are only indicative and will require careful consideration during project preparation exercises. Project resourcing shown in italics for Liberia are conditional on the details and outcomes of related projects undertaken by other donors and agencies.

Table 12: Outline resourcing requirements for research projects

Sierra Leone Centred	Liberia Centred	Duration (Months)		Outline Resourcing Requirements			
		Sierra Leone	Liberia	Sierra Leone		Liberia	
				Foreign	National	Foreign	National
SL1 and L1 Classification of soils and engineering characterization across the country 		12	24	4 months staff time plus costs (£96,000)	6 months staff time, vehicle, driver, fuel for site visits, lab testing facilities	8 months staff time plus costs (£192,000)	6 months staff time, vehicle, driver, fuel for site visits, lab testing facilities
SL2 and L2 Development of a DCP-DN design manual for gravel roads, including testing during construction 		4	12	1 months staff time plus costs (£24,000)	2 months of staff time plus vehicle with driver and fuel for site visits	2 months staff time plus costs (£46,000)	2 months staff time plus vehicle with driver and fuel for site visits
SL3 Trial studies in road surfacing	L3 Workshop on surfacing trials	36 - to include monitoring	2	6 months staff time plus costs (£130,000)	12 months of staff time, vehicle, driver, fuel, lab testing facilities	1 month staff time plus costs (£34,000)	1 month staff time plus Workshop facilities in Monrovia
SL4 Whole-life costing study for different surfacings		6		3 months staff time plus costs (£65,000)	4 months staff time		
SL5 and L5 Feeder Roads Design Manual (strengthened for Liberia, new for Sierra Leone) 		12	18	8 months staff time plus costs (£178,000)	6 months staff time plus vehicle with driver and fuel for site visits	12 months staff time plus costs (£265,000)	6 months staff time plus vehicle with driver and fuel for site visits
SL6 and L6 Strengthened Specifications for feeder roads 		6	8	2 months staff time plus costs (£41,000)	3 months staff time plus vehicle with driver and fuel for site visits	4 months staff time plus costs (£91,000)	4 months staff time plus vehicle with driver and fuel for site visits
SL7 and L9 Development of a system of skills training, safety awareness, certification and registration of motorcyclists 		6	6	4 months staff time plus costs (£87,000)	12 months of SLRSA staff time plus transport and training facilities	2 months staff time plus costs (£48,000)	12 months staff time plus transport and training facilities

Sierra Leone Centred	Liberia Centred	Duration (Months)		Outline Resourcing Requirements			
		Sierra Leone	Liberia	Sierra Leone		Liberia	
				Foreign	National	Foreign	National
		18		4 months plus costs (£87,000)	50 months of local representative time, 10 months of SLRSA staff time plus transport	<i>3 months staff time plus costs (£65,000)</i>	<i>50 months of local representative time, 10 months of staff time plus transport</i>
SL8 and L10 Carry out a pilot study to collect more robust accident data on rural roads 			18				
		6		3 months plus costs (£65,000)	6 months of SLRSA staff time plus transport		
SL9 Public and pedestrian traffic awareness and safety training							
		12	12	4 months staff time plus costs (£87,000)	8 months of SLRA staff time plus transport	6 months staff time plus costs (£125,000)	2 months MPW staff time plus 12 months of specialist enumerator time, plus vehicle with driver and fuel
SL10 Rural access and transport sector diagnostic study	L7 Rural Mobility and Socio-Economic Baseline Pilot Study						
			12			4 months staff time plus costs (£86,000)	2 months MPW staff time plus 12 months of specialist enumerator time, plus vehicle with driver and fuel
	L8 Rural Transport Services Pilot Study						

Note:

Green shaded cell indicates country where research is centred. Green arrow indicates transfer with necessary modification and tailoring from Liberia to Sierra Leone.

Amber arrow and italicised text indicate transfer from Sierra Leone to Liberia with necessary modification and tailoring to cater for specific country and county requirements, but transfer is dependent upon outcome of studies undertaken by other donors/agencies in Liberia.

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Appendix 1: Power point presentation to the Road Transport Infrastructure Partners' Meeting at the MPW Headquarters on 1 September 2016


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Africa Community Access Partnership






AfCAP Liberia

Dr Gareth Hearn
Team Leader, Sierra Leone and Liberia
Scoping Study




Road Transport Infrastructure Partners' Meeting, Monrovia 1 September 2016

 **AfCAP**
Africa Community Access Partnership


Underlying Aims: 2014-2020

Strengthening and promoting more cost-effective and reliable low volume roads and transport services, and facilitating the processes whereby this influences policy and practice in African member countries.

To contribute towards improving the livelihoods of poor people in rural areas of Low Income Countries that are currently constrained by poor access to reaching markets and services.

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Background to AfCAP and the Proposed Way Forward for AfCAP Liberia



 **AfCAP**
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The ReCAP¹ Research Legacy

- Excellence
- Uptake
- Embedment
- Sustainability

¹ Research for Community Access Partnership



AfCAP Research Clusters

- Low volume rural roads
- Transport services
- Cross-cutting issues
- Capacity building and knowledge management



Research Themes: Transport Services

- Public transport services operation and regulation
- Motorcycle taxis and intermediate means of transport
- Rural mobility and access to roads



Research Themes: LVRR

- Sustainable and economical provision of infrastructure
- Optimised use of material resources and environment
- Effective whole life rural road asset management
- Defining, measuring and analysing road access



Research Themes: Cross-Cutting Issues

- Climate change
- Gender
- Road safety



Capacity Building & Knowledge Management

- The objective of capacity building activities is to increase national capacity to initiate, carry out and disseminate research and the sustainability of that capacity in the fields of low volume roads and transport services
- Increased access to, dissemination and take-up of research-derived knowledge for planning, policy & investment decision-making



Proposed AfCAP Research in Liberia

- Engineering Component
- Transport Services and Traffic Safety Component

The MPW is the AfCAP coordinating agency in Liberia



Links Between National and Regional Projects

National programmes continued to be key to the overall strategy. However, increased attention is being paid to work plans between countries rather than projects being selected in isolation and not contributing to a broader national and regional strategy.



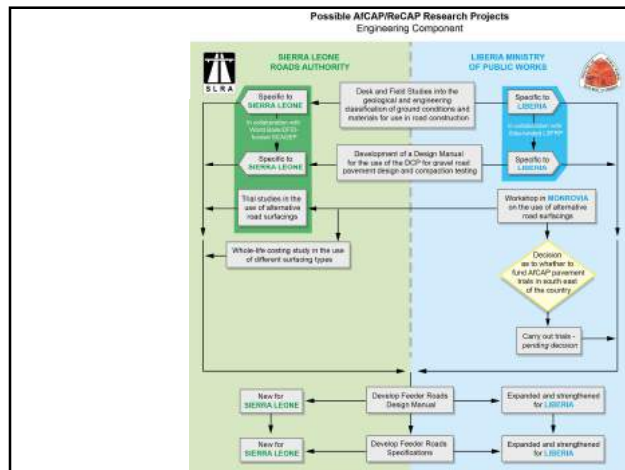
Engineering Component -1

- Geological and engineering classification of ground conditions and materials for use in feeder road construction
- Use of the DCP and other in situ tests in subgrade investigation and the DCP design method for feeder road pavements



Engineering Component - 2

- Convene a workshop in Monrovia on the use of alternative road surfacings – interface FRAMP, EU, LSFRP proposals with AfCAP work and other surfacing trials from eastern and southern Africa
- Based on the outcome of the above review the need for AfCAP involvement in trials elsewhere in the country, eg in the southeast



Engineering Component - 3

- Based on the above, and in parallel with it, expand and strengthen the MPW Feeder Road Design Manual and Specifications to be more inclusive of geographical variability in ground conditions, drainage conditions and materials in the country. Inclusion of the DCP design method and the outcome of the work on alternative surfacing trials and pavement designs



Transport Services & Road Safety Component 1

- Rural access diagnostic study. Pilot study of community needs for motorised and non-motorised access and extent to which these needs are met
- Based on the above, pilot study of interventions to address access needs, including safe, affordable and gender-sensitive forms of transport

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Transport Services & Road Safety Component 2

- Rural motorcycle-taxi skills training, adapting research and application carried out by AfCAP elsewhere

NB the plan is for the collection of road traffic accident data to be strengthened by MoT/MPW and GIZ initiatives, therefore currently no planned AfCAP action on this.

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