

# ReCAP Impact Case study on Ethiopia

## Final Impact Study Report



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HITCON Engineering Plc.

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**HITCON ENGINEERING PLC**

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The views in this document are those of the authors and they do not necessarily reflect the views of the Research for Community Access Partnership (ReCAP) or Cardno Emerging Markets (UK) Ltd for whom the document was prepared

Cover photo: Rural Transport in URRAP Road in Dale Woreda, SNNP Region, Ethiopia; taken by Mesfin, B. (field visit team member)

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## Contents

<b>Abstract</b> .....	<b>v</b>
<b>Key words</b> .....	<b>v</b>
<b>Acknowledgements</b> .....	<b>v</b>
<b>Acronyms, Units and Currencies</b> .....	<b>vi</b>
<b>Executive summary</b> .....	<b>vii</b>
<b>1 Introduction</b> .....	<b>1</b>
1.1 Research for Community Access Partnership.....	1
1.2 Research and Development in Ethiopia.....	1
1.3 Objectives of the Road Research Works and Programs .....	1
1.4 Objectives of the Impact Case Study .....	2
1.5 Organization of the Report .....	2
<b>2 Approach to the Impact Study</b> .....	<b>2</b>
2.1 Project Context .....	2
2.2 Expected Results .....	2
2.3 Impact, Outcome and Output Rating .....	3
<b>3 Findings from Sample Woredas in Oromia and SNNPR</b> .....	<b>3</b>
3.1 Transport Operation and Traffic Movement along Low Volume Roads .....	3
3.2 Transport Fare and Tariff on LVRR.....	4
3.3 Traffic accidents along LVRR:.....	4
3.4 Operation of Ambulance Services along LVRR .....	5
3.5 Improvement in the Delivery of Social Services .....	5
3.6 Increased Road Network and Accessibility.....	5
3.7 Maintenance of Low Volume Roads .....	8
<b>4 Impact, Outcome and Output Evaluation</b> .....	<b>8</b>
4.1 Analysis Approach and Tools .....	8
4.2 Rating and Scoring .....	10
4.3 Evaluation of Impact .....	11
4.4 Evaluation of Outcome and Output Indicators.....	12
4.5 Overall Impact and Performance Rating .....	22
<b>5 Conclusions</b> .....	<b>23</b>
<b>6 References</b> .....	<b>24</b>
<b>Annex 1 Log Frame</b> .....	<b>26</b>
<b>Annex 2 Impact and Benefit Assessment</b> .....	<b>34</b>
<b>Annex 3: Sample Site Photographs and Discussion Pictures</b> .....	<b>47</b>
<b>Annex 4: Impacts of Design Manuals on LVRR in Ethiopia: A Case of Halaba Woreda of SNNPRS</b> .....	<b>51</b>

## Tables and Figures

Table 1	Transport Tariff on LVRR & Number of Transport Routes by Woreda.....	4
Table 2	Growth of the Classified Road Network and Change in Accessibility and Road Density (2007-2019) .....	6
Table 3	Length of URRAP Roads and Other Roads Constructed in the Sample Woredas in km from 2011-2019 .....	7
Table 4	Weighting of the ReCAP Logframe Output Indicators.....	8
Table 5	Groups of Indicators and Log frame Levels .....	9
Table 6	Average Annual Daily Vehicle Kilometre Travelled by Vehicle Type (In Millions).....	11
Table 7	Total Constructed Roads Since 2014 to date .....	13
Table 8	Annual Discounted Net Benefit Streams in Million Br .....	16
Table 9	User Cost Savings.....	17
Table 10	Overall Score for Collaborative Research Projects with ReCAP Research Output.....	18
Table 11	Overall Score for In-house Road Research Projects in ERA/RRC and Collaborative Research with Other than ReCAP Research Collaborators .....	20
Table 12	User Satisfaction Rating .....	22
Table 13:	Overall Rating .....	23

## Abstract

The Research for Community Access Partnership (ReCAP) is a six-year programme of applied research and knowledge dissemination funded by UK aid. In Ethiopia, the first phase of Africa Community Access Partnership (AfCAP) was implemented from June 2008 to July 2014 and the second phase of the programme under ReCAP commenced in 2014 and covers a period of six years.

The impact case study reported here builds on the works done in phase I (June 2008 to July 2014) to demonstrate the contribution of ReCAP research undertaken since 2014 in Ethiopia in a qualitative and/or quantitative manner and in the wider causal package towards improved rural access in Ethiopia.

This impact Study report, apart from assessing the overall performance of the ReCAP supported research works, evaluates the success and contribution of ReCAP programme in bringing the desired impact as well as achieving changes and improved research capacity in Ethiopia. Accordingly, the outcome and the outputs obtained from the research projects for each indicator are reviewed.

From the analysis and evaluation of the Impact, outcome and output indicators it is concluded that the achievement obtained is positive and the contribution of ReCAP collaborated researches were fruitful.

## Key words

ReCAP, AfCAP, Road, Research, Impact, Outcome, output, Benefit, Assessment, and Indicator

## Acknowledgements

The project team would like to acknowledge the help and support of the ReCAP team in commencing the project as planned.

### Research for Community Access Partnership (ReCAP)

#### Safe and sustainable transport for rural communities

ReCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable transport for rural communities in Africa and Asia. ReCAP comprises the Africa Community Access Partnership (AfCAP) and the Asia Community Access Partnership (AsCAP). These partnerships support 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. The ReCAP programme is managed by Cardno Emerging Markets (UK) Ltd.

[www.research4cap.org](http://www.research4cap.org)

## Acronyms, Units and Currencies

AfCAP	Africa Community Access Partnership
AGP	Agricultural Growth Program
ASCAP	Asia Community Access Partnership
CBA	Cost Benefit Analysis
BAS	Benefit Assessment Report
CBPWD	Community Based Participatory Watershed Development
CSA	Central Statistical Agency
DFID	Department for International Development
DBST	Double Base Surface Treatment
E.F.Y	Ethiopian Fiscal Year
ERA	Ethiopian Roads Authority
ETH	Ethiopia
ERA	Ethiopian Roads Authority
FGD	Focus Group Discussion
GBP	Great Britain Pound
HDM	Highway Development and Maintenance. Management System
KII	Key Informants Interview
LVR	Low Volume Road
LVR	Low Volume Rural Road
MONR	Ministry of Agriculture and Natural Resources
MOT	Ministry of Transport
PCDP	Pastoral Community Development Project
PLC	Private Limited Company
PMU	Project Management Unit
PSNP	Productive Safety Net Programme
RAI	Rural Access Indicator
RAM	Road Asset Management
ReCAP	Research for Community Access Partnership
RR	Rural Road
RRA	Rural Roads Authority
RRC	Road Research Centre
RSDP	Road Sector Development Programme
SEACAP	South East Asia Community Access Partnership
SLM	Sustainable Land Management
SNNPRS	Southern Nations, Nationalities and Peoples Regional State
RT	Rural Transport
RTP	Rural Transport Premium
RRC	Road Research Centre
SNNPRS	Southern Nations and Nationalities and People's Regional State
ToR	Terms of Reference
TS	Transport Services
URRAP	Universal Rural Roads Access Programme
WRO	Woreda Road Office

## Executive summary

In Ethiopia, the first phase of Africa Community Access Partnership (AfCAP) was implemented from June 2008 to July 2014 and the second phase of the programme under ReCAP commenced in 2014 and covers a period of six years which is ongoing. This Impact Study project of rural road infrastructure and transport researches is to develop a ReCAP impact study covering the ReCAP logframe impact and outcome indicators and additional impact indicators in Ethiopia.

The expected outcome of the ReCAP programme is “Sustained increase in evidence base for more cost effective and reliable low volume rural roads and transport services, promoted and influencing policy and practice in Africa and Asia”. The expected outputs are:

- **RESEARCH and UPTAKE:** Generation, validation and updating of evidence for effective policies and practices to achieve safe, all-season, climate-resilient, equitable and affordable low volume rural roads and transport services in African and Asian countries.
- **CAPACITY BUILDING:** The building of sustainable capacity to carry out research on low volume rural roads and rural transport services in African and Asian countries.
- **KNOWLEDGE:** Generated evidence base of low volume rural roads and transport services; knowledge is widely disseminated and easily accessible by policy makers and practitioners (including education and training institutions).
- ReCAP Programme is effectively and efficiently managed.

The achievement and benefits assessment and impact analysis has been carried out on the research and capacity building projects since June 2014 to date. During these periods ERA research center has been carrying out about 55 research and capacity building projects namely:

- Collaborative Research Projects with ReCAP;
- Collaborative research with other collaborators and;
- In-house staff-based road research projects in ERA/Road Research Centre

The evaluation of the impact, outcome and outputs are done as per the defined indicators and weightings presented in the ReCAP logframe. It is also combined with the Benefit Assessment Framework presented in ReCAP Benefit Assessment System (BAS)<sup>1</sup> to score the ratings in a reasonable fashion.

Therefore, the overall rating of the outputs is found to be the following:

- As per Benefits Assessment Framework: overall weighted average combined achievement is 75.75percent and is in rating category of Excellent and;
- As per the log frame IMPACT WEIGHTING Component: Weighted average achievement is 77.3 percent which is also in a rating category of Excellent.

The assessment of the level of satisfaction of users of the outputs also showed that the result is found to be 82 percent which is Excellent and in tandem with the above findings. This confirms the overall ReCAP supported research has had a positive impact towards improved accessibility and transport service delivery.

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<sup>1</sup>ReCAP Benefits Assessment System: System Development Report, April 2019

# 1 Introduction

## 1.1 Research for Community Access Partnership

The Research for Community Access Partnership (ReCAP) is a six-year programme of applied research and knowledge dissemination funded by UK aid through the UK Government. The first phase of Africa Community Access Partnership (AFCAP) was implemented from June 2008 up to July 2014 and the second phase, which is under the ReCAP umbrella, commenced in July 2014 and is scheduled to end in July 2020. Ethiopia took part as a partner country in both phases. The ReCAP programme is aiming to have lasting impacts in the countries in which it works so as to demonstrate that the investment in rural roads research and research capacity forms a valuable contribution, among other factors, towards the desired impact.

This Impact Study project of rural road infrastructure and transport research in Ethiopia is to develop a ReCAP impact study covering the ReCAP logframe impact and outcome indicators and additional impact indicator suggestions. The project context, approach and analyses are detailed in subsequent chapters.

## 1.2 Research and Development in Ethiopia

Some form of research capacity has been available to the road sector in Ethiopia since 1965. As part of the Road Sector Development Programme (RSDP), initiated in 1997 and driven by ERA, it became increasingly obvious that the national road research and development capacity had to be strengthened and expanded to support the goals and objectives of the RSDP. Accordingly, the “Research and Development Directorate” was established to support the RSDP to achieve its goals through research and technology transfer activities.

This support was planned to be achieved by strengthening and expanding the research and development stream through establishment of its directorate since 2010 in ERA. Various In-house and collaborative capacity building and road research projects and, technology transfer activities are being carried out under ERA/Road Research Centre (RRC) since the establishment of the “Research and Development Directorate” in 2010.

These include initiatives undertaken in collaboration with AFCAP/ReCAP and other internationally recognized institutions and local universities. The research works are being carried out while placing the required personnel in line with the organizational structure, facilitating and providing the required laboratory equipment and constructing temporary facilities for the staff, etc.

## 1.3 Objectives of the Road Research Works and Programs

The main goal of the research centre and research works is to support the road sector through the provision of independent, innovative and effective knowledge-based solutions for a safe and efficient road network development and asset management of the Ethiopian road network. This also includes achievement of the goal to:

- Coordinate all road and transport research in Ethiopia;
- Attain internationally recognized certification for the management and operations of the research centre;
- Provide commercial research facilities to other East African countries;
- Establish formal collaborative links with other international road transport research organizations for ongoing information exchange and capacity building of the Ethiopian road sector; and
- Be a place where people want to work to facilitate the attraction and retention of quality workforce.



## 1.4 Objectives of the Impact Case Study

The objective of this impact case study is to demonstrate the contribution of ReCAP research undertaken since 2014 in Ethiopia in a qualitative and/or quantitative (where possible and appropriate) manner and in the wider causal package towards improved rural access in the country.

## 1.5 Organization of the Report

While the first chapter gives the introduction of the main objectives, the second chapter describes an approach to the impact study and the expected results. Chapter 3 describes the findings obtained from the sample Regions and Woredas visited. The fourth chapter presents the detailed approach and method of evaluation with the result obtained. The last chapter provides conclusions with highlight of the way forward.

# 2 Approach to the Impact Study

## 2.1 Project Context

Since 2014 close to £1 million has been spent under the ReCAP programme in Ethiopia and significant contributions were also made by the government and other development partners for the construction of the research centre, road research sections, financing of road maintenance trials, training, and in-kind support to the research projects. The ReCAP programme is aiming to have lasting impacts in the countries it works with to demonstrate that the investment in rural roads research and research capacity forms a valuable contribution, among other factors, towards the desired impact.

The definition of ReCAP's impact according to the logframe is to achieve increased low volume rural roads and transport services, safe and reliable access in Africa and Asia, improving livelihoods of poor men and women, and improving economic growth. Its outcome is defined as "Sustained increase in evidence base for more cost effective and reliable low volume rural road and transport services, promoting and influencing policy and practice in Africa and Asia".

The Impact Case Study for Ethiopia is to evaluate the success of the contribution of the ReCAP programme in achieving the desired impact of changes and improved research capacity in the country. Accordingly, the impacts, outcomes and outputs obtained from the research projects for each indicator is reviewed in this study.

## 2.2 Expected Results

The ReCAP projects aspire to obtain successful results in achieving increased low volume rural road and transport services that ensure safe and reliable access in Ethiopia. To evaluate the impact, the changes brought at the end of the ReCAP program are measured by comparing them with the conditions of the base year at which the second phase of ReCAP started. The outcomes and outputs are measured in a similar manner as per the ReCAP logframe together with the user satisfaction survey findings. The following are considered as the desired targets.

### **Expected impact:**

Increased low volume rural road and transport services safe and reliable access in Ethiopia improving livelihoods of poor men and women and improving economic growth.

### **Expected outcome:**

Sustained increase in evidence base for more cost-effective and reliable low volume rural roads and; transport services promoted and influencing policy and practice in Africa and Asia.

### **Expected Outputs:**

- **RESEARCH and UPTAKE:** Generation, validation and updating of evidence for effective policies and practices to achieve safe, all-season, climate-resilient, equitable and affordable low volume rural roads and transport services in African and Asian countries.
- **CAPACITY BUILDING:** The building of sustainable capacity to carry out research on low volume rural roads, and rural transport services in African and Asian countries.
- **KNOWLEDGE:** Generated evidence base of low volume rural roads and transport services knowledge is widely disseminated and easily accessible by policy makers and practitioners (including education and training institutions).
- ReCAP Programme is effectively and efficiently managed including user satisfaction rating.

Also other impact factors of the ReCAP programme that are illustrative of its contribution are to be evaluated and presented in the impact study report.

### 2.3 Impact, Outcome and Output Rating

As mentioned above the ReCAP contributions are measured using the individual impact, outcome and output indicators presented in the ReCAP logframe. The comparison and the scoring are implemented using the principle and methods provided in ReCAP logframe and the ReCAP Benefit Assessment System (BAS) document. The rating for individual indicator is evaluated as much as possible supported by evidence data and information obtained from the key stakeholders. The methodology and scoring are presented in chapter 4 of the report.

## 3 Findings from Sample Woredas in Oromia and SNNPR

A total of six sample woredas (three each from Oromia and Southern Nations Nationalities and People's Regional State (SNNPRS)) were selected to assess on the ground the impact of the construction of LVRR. In the six selected woredas, it was observed that the Universal Rural Roads Access Program (URRAP) roads are designed and constructed using the LVRR design manual while the Productive Safety Net programme (PSNP) rural roads used Community Based Participatory Watershed Development (CBPWD) Guidelines.

The use of the LVRR design manual in the construction of URRAP roads has made significant contribution and difference in road construction and in creating sustainable engineered roads that improved accessibility and connectivity to the rural poor. It has set an improved standard for road construction works when compared to other types of rural roads that are constructed under the PSNP.

The assessment is done mainly based on qualitative and quantitative data and information collected from Regional and Woreda sector offices that are responsible for road and transport (Key Informants), transporters, etc. Qualitative approach was followed for some indicators for the assessment and presentations of findings due to lack of properly organized quantitative data and information.

### 3.1 Transport Operation and Traffic Movement along Low Volume Roads

In the surveyed sample woredas, the commonly known types of transport services providers and operators along rural roads that are constructed under the URRAP and other programmes include motor bikes, Bajaj (three wheelers), mini buses (with 12 seaters), medium buses (35 passengers), medium truck (3.5 ton) and animal drawn carts. Among the above transport operators, the most widely used and operated along the roads include motor bikes, Bajaj (three wheelers) and animal drawn carts. Medium buses and mini buses mostly operate during weekly market days when the demand for transport services increases.

Vehicles that can operate on URRAP roads should have a maximum of 3.5 tons capacity as per the Government's regulation; nonetheless, in many places vehicles above 3.5 tons also use URRAP roads to transport construction materials without having any administrative permit.

In some woredas, such as Dugida, in addition to public transport service providers, dump trucks use URRAP roads to transport sand and gravel for construction works. In Dugida woreda, there are several locations that sand and quarry rocks are extracted for major road construction works and other construction activities. The frequent use of URRAP roads by dump trucks contributes to the quick deterioration of the road beyond their planned technical life span.

### 3.2 Transport Fare and Tariff on LVRR

Transport fares and tariff on URRAP roads varies from one woreda to another since there is no established standard or uniform rate for all localities. Transport fares on rural roads and URRAP roads varies from Birr 0.59 to Birr 1 per km in Dale woreda. In Halaba woreda it ranges from 0.71 Birr to 1 Birr per km length. Typical costs are shown in table 1.

Transport operators report that the tariff set by the Government is not sufficient to cover their costs. According to the transport operators, the tariff that is set by the Government fails to consider and recognize the existing conditions of the roads, from time to time increasing vehicle operating costs and other related issues. The problems that affect and contribute to the operation cost increase include increment of cost of fuel, spare parts and maintenance costs.

Due to lack of regular regulation and supervision carried out by transport offices on operators along rural roads, the transport operators charge passengers more than the tariff set by the government. In some woredas (Dugida), motor bikes charge passengers from 30-40 Birr for shorter distances on rural roads. Customers are captive to the price set and pay the amount. This is due to absence of other alternative transport options and providers which is a prevailing problem in the country.

The Regional States are responsible for establishing transport tariffs and revising them from time to time for transport companies that operate within the region. Prior to the construction of roads under URRAP, the public used to travel place to place, to woreda centres or from one kebele to the other using trails and tracks.

**Table 1 Transport Tariff on LVRR & Number of Transport Routes by Woreda**

Regional State	Woreda	Average Km Tariff in Birr	Number of URRAP roads (transport routes) used by transport operators	Remark
Oromia	Adea	NA	3	
	Dugida	1 Birr	8	Motor Bikes sometimes charge flat rate of 30-40 Birr for short distances
	NegeleArsi	NA	10	
SNNPRS	HalabaKulito	0.846-1 Birr	3	
	Dale	0.59-1 Birr	3	
	Shebedino	0.71-1 Birr	3	

### 3.3 Traffic accidents along LVRR:

Since the construction of a LVRRs are completed over the past seven years the size and volume of traffic movement has been increasing from time to time. Similarly, an increase of reported cases of minor traffic accidents has been noted on low volume rural roads associated with the increase of traffic movement. Also, one fatal accident was reported in Shebedino woreda in SNNPRS recently.

Even though there is no detailed recorded data available on the number of accidents and injuries, it was understood that most reported minor traffic accident cases involve motor bikes. The causes for the accidents are mainly related to lack of road-side traffic signage and terrain conditions.

### **3.4 Operation of Ambulance Services along LVRR**

Outside public transport service providers, other types of vehicles that operate along URRAP and on other types of community roads are ambulance services. Following the construction of URRAP and also other types of rural roads, ambulance services were among the first to use the roads. The construction of rural roads is highly appreciated by local communities and authorities, first and foremost because it is primarily used by the ambulance services. Ambulance services make a paramount contribution in saving the lives of rural people. Prior to the construction of rural roads, transporting pregnant women and seriously sick patients during emergency situations to nearby clinics or hospitals was unthinkable. But following the construction of rural roads and the introduction of ambulance services, transporting pregnant women and seriously sick patients timeously to nearby and distant health facilities has become much easier.

### **3.5 Improvement in the Delivery of Social Services**

Various studies carried out on creating access to social services and facilities and also on rural accessibility show that the construction of URRAP and other types of low volume rural roads are said to be highly beneficial in creating access to social and economic aspects. In the sample woredas, even though there is no properly recorded quantitative data that shows the changes in the accessibility to social services, stakeholders and community members interviewed have stated that construction of low volume rural roads has made an important contribution to the improvement and increase in agricultural production and marketing, and also in improving the delivery of social services, such as education and health facilities.

A welfare monitoring survey (CSA, 2016) reveals that in Oromia, 29.04 percent of households reside less than 1 km from first cycle (1-4) primary schools and 64.27 percent reside between 1 and 4 km from these facilities. On the other hand, in SNNPRS 22.7 percent and 68.86 percent of households resides less than 1 km and between 1 and 4 km from first cycle primary schools, respectively. The distribution of household by distance from health facilities at country and regional levels shows that the majority of the households reside 1-4 km distance from clinics, health centres, health posts and prenatal care. Only 10 percent of the households in Oromia and SNNPRS reside 1-4 km from hospitals. As indicated above, the construction of rural roads contributes to increased access to these facilities.

It is found from the interview of local people and officials that prior to the construction of URRAP roads the timely supply and delivery of agricultural inputs was very limited, particularly to villages that are located in remote and inaccessible areas. However, following the construction of URRAP roads, the supply and delivery of inputs as well as function and social services has improved a lot. Farmers were also able to have access within a short period in comparison with the time required before the construction of the roads.

It is also mentioned that following the construction of rural roads, the number and enrolment rate of school children has increased and in particular the number of girls attending primary schools has also increased.

Transport services were not available before, since there were no all seasoned roads that could be used by motorized transport. After the construction of the all seasoned roads, transport routes were identified and operators started to use the roads.

### **3.6 Increased Road Network and Accessibility**

Creating access and connectivity is one of the major objectives of URRAP. Under URRAP, connecting kebele to kebele and also with woreda centres is one of the major contributions of the construction of low volume rural roads. The overall road network expansion and improvement shown in table 2 below has resulted a significant impact in improving:

- a) **Road Density:** The registered road density has increased from 90.5km per 1000 km<sup>2</sup> or 1.1km per 1000 population in 2014 to 125.6km 1000 km<sup>2</sup> or 1.26km per 1000 population in 2019.
- b) **Rural Access Index:** The Rural Access Index (RAI) measures the number of rural people who live within two kilometres (typically equivalent to a walk of 20-30 minutes) of an all-season road as a proportion of the total rural population. The road network expansion recorded in the assessment period has increased the average RAI for the whole country from 50 percent in 2014 to 69 percent in 2019. The total change in Rural Access Index from 2014 to 2019 is about 19 percent.

**Table 2 Growth of the Classified Road Network and Change in Accessibility and Road Density (2007-2019)**

Year	Paved	Gravel	Rural	Woreda	Municipality paved	Municipality paved Gravel	Total	Growth Rate (%)	Road Density /1000 popn	Road Density /1000 Sq.km	Rural Pop'n Within 2km Access	Rural Access Index (%)
2014	12640	14217	33609	39056			99522	15.8	1.1	90.5	36,045,561	50
2015	13,551	14,055	30641	46810	1693	3664	110414	10.9	1.2	100.4	40,630,189	55
2016	14632	13400	31620	48057	1693	3664	11306	2.4	1.23	102.8	42,521,783	57
2017	15886	12813	33367	52,748	1693	3664	120171	6.3	1.3	109.2	46,368,456	60
2018	15886	12813	35985	56,732	1693	3664	126773	5.5	1.3	115.2	51,897,921	64
2019	15886	12813	30923.7	62579	1914	20782.65	144898.4	9	1.26	125.6	60315573	69

Source: RSDP 22 Years Performance Assessment Report, 2020 with some adjustment on URRAP based on ERA Rural Road Technical Support branch current data that is not included in the 22 years which is addition 867 km road

In addition, pursuant to the World Bank review of the Ethiopian rural roads program study report (Taylor et al. 2018) whereby an econometric analysis was carried out using geospatial data and a household survey; has suggested that the URRAP road development in Ethiopia since 2010 in general has increased household welfare, particularly for poorer households. The impact was found to be greater in more remote areas. According to the report, the rural road development has profoundly improved connectivity/accessibility in terms of:

- Network expansion with 85,000 km of the LVRR of which the URRAP roads cover 56,000 kms and these roads are designed using the LVRR manuals.
- Improved travel time to the nearest towns and;
- Overall positive impact on household consumption that:
  - Rural roads developed between 2010 and 2014 increased consumption by 17- 23 percent in 2012-16 ;

- Rural roads developed between 2010 and 2014 increased consumption by 25-36 percent in remote communities (as opposed to 15-18percent overall impacts) ;
  - Rural roads developed between 2010 and 2014 increased consumption by 21-27 percent (2014-16) in drought areas (as opposed to 8-10percent overall effect) ;
  - Rural roads developed between 2014 and 2016 increased consumption by 9 percent(2014-16) in drought areas (as opposed to no clear overall effect) ;
  - Rural roads reduced the chance of falling into poverty (or increased the chance of getting out of poverty) by 13-15 percent between 2012 and 2016;
  - Rural roads mitigated drought shock by reducing the chance of falling to poverty by 20percentin drought areas between 2014 and 2016 (as opposed to 8 percent overall effect) ; and
  - and such benefits were greater in communities farther away from towns and/or hit by droughts.
- And without the rural roads,
    - household consumption would have become 20percent lower between 2012 and 2016; and
    - 15percent more households would have become poor between 2012 and 2016.

Although there is no properly organized data available that shows year by year growth of the road network in the surveyed woredas, the data on the length of low volume roads constructed from 2011-2018 is presented in Table 3 for each sample woreda.

**Table 3 Length of URRAP Roads and Other Roads Constructed in the Sample Woredas in km from 2011-2019**

Regional State	Woreda	URRAP roads constructed (km)	PSNP Roads (km)	Agricultural Growth Program (AGP) Roads (km)	Rural road (km)
Oromia	Adea	148.12		8.5	-
	Dugida	136.56	-	-	14
	Negele Arsi	72	-		45
SNNPRS	Halaba Kulito	348	43.1	-	
	Dale	54	31	-	
	Shebedino	77	-	-	
<b>TOTAL</b>		<b>835.68</b>	<b>74.1</b>	<b>8.5</b>	<b>59</b>

The coverage and total size of URRAP roads constructed in some woredas reached more than 50 percent of the total length of LVRR. For instance, in Dale woreda it reached 54km and constitutes 27 percent of low volume roads, and when PSNP and other community roads are included it constitutes 54 percent of the total length of roads in the woreda. In Dugida, 16 roads are constructed under URRAP. In Adea woreda, out of the 22 kebeles, 21 kebeles are connected with rural roads and since 2014 the numbers of road users have increased significantly. Since 2011 all URRAP roads are constructed using the LVRR design manual and it is

reported to have set the standard and is easing making cost estimates. The design manuals that were used prior to the introduction of the LVRR design manual have a number of gaps in cost calculation and estimation.

In Oromia, the design for URRAP roads is prepared as per the revised LVRR design manual that came available in 2016. Until 2018, the design for URRAP roads was prepared by individual consultants employed by the Regional Roads Authority. However, since 2019 this procedure has been changed and the responsibility for designing URRAP roads is that of the Zonal Roads office. The procurement process for the construction of URRAP roads is the responsibility of the Zonal administration and hence, the Zonal administration is also responsible for its monitoring.

### 3.7 Maintenance of Low Volume Roads

Lack of regular and continuous maintenance is the main problem affecting low volume rural roads (PSNP and URRAP roads) in most of the surveyed woredas. Not all woredas have started the maintenance of URRAP roads. Those that have started maintenance work in 2018-2019 include Dugida in Oromia and Halaba in SNNPRS. The main reason for the lack of regular maintenance and rehabilitation works is the shortage of financial resources.

Sample field data collection and discussion pictures are shown in Annex 3. Annex 4 shows the impacts of Design Manuals on LVRR in Ethiopia: A Case of Halaba woreda of SNNPR.

## 4 Impact, Outcome and Output Evaluation

As mentioned earlier, the evaluation of the impact, outcome and outputs is implemented as per the defined indicators and weightings presented in the ReCAP logframe also including the findings from user satisfaction survey. These are combined with the benefit assessment framework presented in the ReCAP Benefit Assessment System (BAS)<sup>2</sup> to score the ratings in a repeatable, consistent and equitable manner. The method enables not only rating the scores but also provides a fair way of comparing the result in both methods. The detailed evaluation and analysis are described hereunder.

### 4.1 Analysis Approach and Tools

The ReCAP logframe contained the detailed input, output, and outcome and Impact indicators shown in Annex 1. Table 4 also shows the weightings given for the output indicators defined by the ReCAP logframe.

**Table 4 Weighting of the ReCAP Logframe Output Indicators**

Output Indicator	Output 1	Output 2	Output 3	Output 4 *
<b>Description</b>	<b>UPTAKE:</b> Generation, validation and updating of evidence for effective policies and practices to achieve safe, all-season, climate-resilient, equitable and affordable LVRR and transport services.	<b>Capacity Building:</b> The building of sustainable capacity to carry out research on low volume rural roads, and rural transport services in Ethiopia.	<b>Knowledge:</b> Generated evidence base of LVRR and transport services knowledge is widely disseminated and easily accessible by policy makers and practitioners (including education and training institutions).	ReCAP Programme is effectively and efficiently managed.

<sup>2</sup>ReCAP Benefits Assessment System: System Development Report, April 2019

Output Indicator	Output 1	Output 2	Output 3	Output 4 *
Weight	40 Percent	25 Percent	20 Percent	15 Percent

\* Output 4 is an internal logframe indicator between Cardno and DFID on which the partner institution has no influence. For this reason the allotted weighting is used to measure user satisfaction survey findings as described in section 4.4.4.

Similarly, the benefits assessment framework used is taken from BAS development report, which proposes a system approach where the benefits and impact assessment are viewed as an open system, which is composed of a number of interacting and interdependent parts, called subsystems. The system is viewed as “an organised whole” made up of sub-systems integrated into a unity or orderly totality. These elements operate in an environment that interacts with and that influences it. With this it is proposed to develop the benefits assessment framework that consists of the following six (6) sub-systems or assessment areas. The performance measures are categorized according to these sub-systems:

- a) Research products and extent of use indicators;
- b) Economic indicators (benefits and costs);
- c) Socio-economic indicators;
- d) Safety indicators;
- e) Environmental indicators;
- f) User satisfaction and value indicators.

The indicators in each subsystem are weighted based on their relative importance or contribution to defining the indicator for that subsystem. The weighted scores for each subsystem are summarised in a report or score card. A comprehensive list of performance indicators for each area and the level in the logframe are summarised in table 5. The detailed grouping and analysis made with this approach is shown in Annex 2.

**Table 5 Groups of Indicators and Log frame Levels**

Subsystem	Groups of Indicators and examples	Type	Logframe level
A	Research product & usage <ul style="list-style-type: none"> <li>• Achievement of Research Objectives</li> <li>• Types of Products from Research</li> <li>• Adoption for Implementation</li> <li>• Extent of Use</li> </ul>	Quasi-quantitative	Output & Outcome
B	Economic <ul style="list-style-type: none"> <li>• Agency Costs (capital and operation)</li> <li>• Vehicle operating costs</li> <li>• User costs(travel and transport costs)</li> <li>• Safety costs</li> </ul>	Quantitative	Input, Outcome & Impact



Subsystem	Groups of Indicators and examples	Type	Logframe level
C	Socio-economic <ul style="list-style-type: none"> <li>• Access to health care, social, and educational facilities</li> <li>• Economic activities (farming, retail, etc)</li> <li>• Travel and transport costs</li> <li>• Employment</li> <li>• Household income</li> <li>• Social integration</li> <li>• Women/youth empowerment</li> </ul>	Quasi-quantitative	Outcome & Impact
D	Safety <ul style="list-style-type: none"> <li>• Accident rate/density</li> <li>• Fatality rate</li> </ul>	Quantitative	Outcome & Impact
E	Environmental <ul style="list-style-type: none"> <li>• Climate change</li> <li>• Air quality</li> <li>• Noise abatement</li> <li>• Erosion</li> <li>• Wet land and Nature</li> </ul>	Quasi-quantitative	Outcome & Impact
F	User satisfaction and Value <ul style="list-style-type: none"> <li>• Awareness</li> <li>• Access</li> <li>• Acceptability</li> <li>• Use</li> <li>• Value</li> </ul>	Quasi-quantitative	Outcome & Impact

## 4.2 Rating and Scoring

The evaluation of achievement and benefits is carried out on the research and capacity building projects that have been undertaken between June 2014 and March 2020. During this period, ERA RRC carried out about 55 research and capacity building projects by:

- Collaborating with ReCAP
- Collaborating with other research partners
- In-house staff based road research projects in ERA/RRC

The rating and scoring of the overall impact was done using the combined methods of the ReCAP logframe and Benefit Assessment Framework to produce combined scores considering:

- a) Defined Log frame weighting (percent) (proportionally taken from benefit analysis framework)
- b) Benefit Assessment framework weighting (Level of Achievement and maximum score possible)

The overall rating and scoring is then given accordingly and evaluated as per the following scale:

- **Score > 75 percent – Excellent:** The research fully achieved its objectives, has developed products that are readily available and adopted by national agencies. These products are widely used by local and national agencies, and other institutions.
- **60 percent < Score ≤ 75 percent – Good:** The research partially achieved its objectives, has partially developed products that are available and adopted by national agencies. Several local and national agencies and other institutions use these products.

- **45 percent < Score ≤ 60 percent – Fair:** The research barely achieved its objectives, has developed products that are in the early stages of availability and adoption by national agencies. Few local and national agencies and other institutions use these products.

The projects are accordingly evaluated using the above approach and the results are shown in Annexes1 and 2. The details are as shown in the following.

### 4.3 Evaluation of Impact

**The desired Impact according to the ReCAP logframe is:** Increased low volume rural road and transport services as well as safe and reliable access in Ethiopia are improving livelihoods of poor men and women and improving economic growth.

**Impact Indicator 1:** The percentage of the rural population in Ethiopia who live within two kilometres of an all-season road (RAI: Rural Access Index);

The overall performance assessment of the RSDP (ERA, 2019) shows that the country’s road network has increased from 99, 552 km in 2014 to 144,898.4 km in 2019 as shown in table 2 under section 3.6 above. The overall road network expansion and improvement shown in table 2 under section 3.6 above has resulted in a significant impact in improving:

- Road Density:** The registered road density has increased from 90.5km per 1000 sq. km or 1.1km per 1000 population in 2014 to 125.6km 1000 sq. km or 1.26 km per 1000 population in 2019.
- Rural Access Index:** The RAI measures the number of rural people who live within two kilometres (typically equivalent to a walk of 20-30 minutes) of an all-season road as a proportion of the total rural population. The road network expansion recorded in the assessment period has increased the average RAI for the whole country from 50 percent in 2014 to 69 percent in 2019. The total change in Rural Access Index from 2014 to 2019 is about 19 percent.

**Impact Indicator 2:** Rural transport premium (fares per passenger-kilometre on LVRR relative to fares on long-distance bus services) tracked in three focus countries;

In general, the number of AfCAP and ReCAP projects targeting transport service improvement in Ethiopia is limited. However, indirectly considering the earlier mentioned contributions on road infrastructure expansion, improvement of connectivity and accessibility will have a role in increasing the vehicle fleet and use.

As reported in 22 years assessment report (ERA, 2019) and final report of Sustainable Development Goals (SDGs)/Millennium Development Goals (MDGs) transport indicators (WT Consult, 2019); the traffic on the main roads reveals a rapid and continuous increase in the volume of motorized traffic. Vehicle kilometre of travel increased from 17 million in 2014 to 27 million in 2017, showing an average annual increase of 10.6 percent. The summary of the Total Average Annual Daily Vehicle Kilometres is shown in table 6 below.

**Table 6 Average Annual Daily Vehicle Kilometre Travelled by Vehicle Type (In Millions)**

Vehicle Types	2006/07	2010/11	2014/15	2017/18
Truck	1.43	2.16	2.865	4.64
Bus	1.82	3.27	4.885	7.61
Car	3.24	4.98	7.119	11.2
Truck Trailer	1.21	1.72	2.384	3.69
<b>Total</b>	<b>7.71</b>	<b>12.1</b>	<b>17.25</b>	<b>27.1</b>

**Source:** RSDP Performance and Sustainable Development Goals (SDGs)/Millennium Development Goals (MDGs) Transport Indicators, Final Report 2017/2018

The Final Report of RSDP Performance and MDG Transport Indicators 2017/18 (E.F.Y 2010) Vehicle Operating Costs (VOC), which is put in the report as indicator 4, states that road geometry, condition (roughness) and consumption of inputs in relation to changes in condition and prices influence the level of VOCs. In assessing changes in VOCs using the following indices have been monitored:

**Index A:** VOC for prices for selected vehicle, fuel, lubricants, workshop hours and tires compared with retail prices.

**Index B:** VOC savings due to change in road condition (roughness) per vehicle km.

**Index C:** VOC savings due to change in road condition (roughness) for total vehicle km.

The most important parameter considered for tracking changes in VOC savings is road surface condition. Vehicle operating costs are a summation of fuel and lubricant consumption; tire wear, vehicle depreciation and maintenance and repair costs, as well as crew costs, based on the computation using Highway Development and Maintenance, Management System (HDM) relay on the infrastructure between roughness values (IRI values) and the level of consumption of inputs, as well as input prices.

The trends over twenty years (1996/97 to 2017/18) shows that average vehicle operating cost index (Index A) had risen from 100 in 1996/97 (base year) to 941.51 in 2017/18, an increase by over 841 percent compared to the base year and an annual growth of 11.27 percent.

## 4.4 Evaluation of Outcome and Output Indicators

### 4.4.1 Outcome Indicators

**OUTCOME: Sustainability:** i.e. Partner Government and other financiers co-funding research with ReCAP Contribution in kind (K) relates to funding of trial sections, staff time, dissemination and training. Core contributions (C) relates to funding of research programme core costs, research contracts, capacity building and knowledge management.

The finding of achievement from benefits assessment and Impact analysis with respect to the capacity building and research projects and in terms of the defined log frame Outcome Indicator 1, Outcome indicator 2 and Outcome Indicator 3 are presented as follows:

**Outcome Indicator 1:** SUSTAINABILITY: Partner Government and other financiers co-funding research with ReCAP.

The research assessment finding indicates that following the phase I and II ReCAP commitment and support government and other financiers are co-funding the research and capacity building work. These include funding from:

- Government funding in-house studies of 36 applied research projects and construction of the main Road Research Facility;
- Grants from EU and for RRC laboratory facilities
- Global Resilience Partnership (for MetaMeta research project) and 2 JICA projects and;
- World Bank for the equipment for the new RRC building (19 million US\$)

The commitment and allocation of funds by the partner agencies indicate that the outcome indicator no.1 is achieved.

**Outcome indicator 2:** Concrete examples of change (applied or formally adopted), influenced by ReCAP research that will be applied to kilometres of roads in Ethiopia.

The main influencing and contributing outputs of the research project components which are developed or updated since 2014 include design manuals, specifications, climate adaptation handbook and guidelines, gender mainstreaming in rural road construction in Ethiopia, impacts and implications guides, etc. These outputs are applied to the construction of 38,163.8 km of roads since 2014, meeting the expected achievement of outcome indicator 2. Table 7 below shows the roads that are constructed since 2014.

**Table 7 Total Constructed Roads Since 2014 to date**

No.	Road Type	Length
1	Main Roads	4000km
2	Regional Rural roads	10011.8km
3	URRAP Woreda Road and AGP 633km roads built to URRAP standard	24152km
<b>Total</b>		<b>38163.8 Km</b>

**Outcome Indicator 3:** Number of citations in academic articles of ReCAP reports and/or working papers, conference papers, etc.

The research status review indicates that there are a number of reference documents containing different road, bridge, environment and gender related issues and series of manuals that have been produced by ERA/RRC in-house and through ReCAP collaboration research, which include:

- Climate adaptation handbook and guideline on LVRR, which is a ReCAP regional project,
- Final Review and Completion of Specifications and Standard Drawings,
- Feedback and Dissemination Workshop for revised ERA 2013 Manuals and
- Specification, Low Volume Roads Manuals, 2016 (Parts A, B, C, D, E, F) and
- Gender Mainstreaming in Rural Road Construction in Ethiopia.

These documents could be found in [www.era.gov.et](http://www.era.gov.et) and Rural Access Library at <http://research4cap.org> websites.

The RRC has conducted five annual Conferences since June 2014 on research projects. List of summarized thematic areas and number of presentation and discussion areas covered on each of the annual conference researches, type of documentations and statuses are presented in the research status report (Demissie, M., Addisu, A. and Mezgebu, D., 2020). From the five annual conferences held since June 2014, the below listed items are the proportion of type of documentation and status presented by the In-house Researcher/Presenter and Invited Researches on 10 thematic research areas:

- 3 Abstracts and power point type of documentation and its status presented by In-house Researcher/Presenter
- 16 total full paper and power point type of documentation and its status presented by In-house Researcher/Presenter
- 5 Abstracts and power point type of documentation and its status presented by Invited Researches
- 19 total Full paper and power point type of documentation and its status presented by Invited Researches

The proportion of presentations by in In-house Researcher/Presenter shown above indicates that the capacity of the in-house researcher is growing. The proportion of distribution of the 43 presentations during the annual conference among the 10 thematic areas are:

- 1 Beneficiary assessment of Rural Access
- 7 Construction Management
- 1 Highway Design
- 1 Landslide
- 1 Landslide and geotechnical
- 2 Material Database
- 17 Material Pavement

- 4 Pavement material
- 1 Road Construction (Paved)
- 8 Transport Engineering

It can be understood that the conference has created a good environment for knowledge sharing from the In-house Researcher/Presenter and by Invited Researchers. In addition, it is observed from the status of the conference paper coverage that the topics that were covered most included material pavement, transport engineering and construction management with 17, 8 and 7 of the 43 presentations respectively.

Internationally published research projects include the following:

- Environmentally optimized approach to road design (TRB, USA, 2015)
- Assessment of Foamed Bitumen performance on Ambo Gedo (CAPSA15, South Africa, 2015)
- Can Humans Predict the Future: Consequences of Inaccurate Traffic prediction (Kenya, 2016)
- Impact of Road Condition on Rural Transport Services (T2, Zambia, 2017)
- Engineering geology of cinder gravel in Ethiopia: Prospecting, testing and application to low volume roads (Springer Nature; July 2018; Bulletin of Engineering Geology and the Environment)

#### 4.4.2 Output Indicators

##### A. Collaborative Research Projects within the framework of ReCAP

**OUTPUT 1** of the logframe is related to RESEARCH and UPTAKE: Generation, validation and updating of evidence for effective policies and practices to achieve safe, all-season, climate-resilient, equitable and affordable LVRR and transport services.

The performance status of the nine ReCAP collaborative research projects shows that the outputs of eight out of the nine research projects are already being moved to implementation stage and the remaining one, which concerns Performance monitoring of trial sections is still ongoing. From these nine projects, eight are related to Output Indicator 1.1 and Output Indicator 1.3 as shown below which is part of the ReCAP logframe that is to be used for ReCAP Impact Case study on Ethiopia:

**Output Indicator 1.1:** LVRR: Number of peer reviewed reports generated from ReCAP supported or related LVRR research projects made available in open access format.

On [www.era.gov.et](http://www.era.gov.et) and Rural Access Library at <http://research4cap.org> websites the following documents could be downloaded:

- Climate adaptation handbook,
- Final Review and Completion of Specifications and Standard Drawings,
- Feedback and Dissemination Workshop for revised ERA 2013 Manuals and
- Specification, Low Volume Roads Manuals, 2016 (Part A,B,C,D,E,F) and
- Gender Mainstreaming in Rural Road Construction in Ethiopia

**Output Indicator 1.3:** ENGINEERING RESEARCH: National policies, manuals and guidelines and document outputs fully incorporated into Government/Ministerial requirements, specifications and recommended good practice that have been modified or introduced as a result of ReCAP engineering research (including climate change adaptation) ownership.

- Final Review and Completion of Specifications and Standard Drawings,
- Feedback and Dissemination Workshop for revised ERA 2013 Manuals and
- Specification, Low Volume Roads Manuals, 2016 (Part A,B,C,D,E,F) and
- Gender Mainstreaming in Rural Road Construction in Ethiopia
- Climate adaptation handbook,

It should be noted that the same documents are referred /reported in different indicators to indicate that the intended output indicator is achieved or not in terms rating these documents.

Pursuant to the progress status and as mentioned in outcome indicator 2 above, most of the research project outputs are already moved to implementation stage or has been fully adopted by ERA, regional research project roads and Woreda Roads. These include the ReCAP technical support project for RRC.

## **B. Economic indicators (Benefits and Costs);**

**Cost Benefit Analysis (CBA):** URRAP roads are built using the low volume manuals that are developed during Phase I of the AFCAP Program and that have been in use since 2010/11. The manuals have been used for building more than 63,208 kms of URRAP standard roads of which 633km are Agricultural Growth Centre (AGP) roads under responsibility of Ministry of Agriculture and Natural Resources (MOANR). The manuals have also been revised in 2016 with ReCAP support.

The Cost benefits analysis of the developed Low volume manuals are assessed and analysed on their use in URRAP standard road network development. More than 24152km of roads have been built since 2014 as reported in the RSDP 22-year report. The benefit analysis is carried out considering the two counterfactual assumptions of access or rural roads constructed without using the low volume manuals compared with URRAP Roads that are built using the low volume manuals. The counterfactual and the basis of scenarios that are used for comparison are:

- a) Construction of 24152km to all weather URRAP Standard using the low volume manual to average 5.5 to 5.8 mt width;
- b) Construction of 24152km to Earth Road or PSNP earth Road Standard 3.3mt width not using Low Volume Manuals;
- c) Construction of 24152km to PSNP Standard 30 percent gravel surfaced 3.3mt width not using Low Volume Manuals.

It is also assumed that prior to construction of all roads; track or trail group roads existed with widths varying from 2 to 3mt. With this and the above assumptions the cost benefit analysis is carried out using HDM4 benefit analysis method, with the following basic input data for the analysis:

- URRAP Roads construction to average 5.5 to 5.8 mt width with a unit cost of 632,550 Birr/km, which is calculated from total expenditure of 39.582 billion birr that was spent on the construction of 62575 km as reported in RSDP 22 year report;
- A unit cost of 125,000Birr/km is used for Earth Road or PSNP Earth Road Standard of 3.3mt width (Source: World Bank report of RR Review Main Report 11062018) ;
- A unit cost of 160000 birr/km is used for PSNP Standard roads with assumed 30 percent to be 5cm gravel surfaced roads of 3.3mt width in which case the cost per km adds to the above cost of 125000 birr/km;
- A construction periods of 4 years(from 2014 to 2017 for option above) is assumed for a total length of URRAP which is 24,152km;
- 15 years time horizon is considered to be the analysis period;
- Assumed speed limit are 25,35 and 55km/hr for “a”, “b” and “c” options of road group listed in table 6 above;
- Estimate of indicative traffic volume is done for the existing road using the Daily motorized Traffic flow on URRAP roads as per:
  - The impact study and survey (WT Consult, 2014/15);
  - The impact study and survey (WABEKBON plc , 2017) and;

- Rural road review main report (World Bank Group, 2018)
- It is assumed that maintenance work will formally start according to the 10-year rural road master plan of 2020 to 2030 since there is no systematic maintenance and funding arrangement for all URRAP constructed roads. With that in the HDM4 analysis it is assumed that maintenance funding will start in 2021.

With this and other related assumptions the following range of benefits for each option is obtained using HDM4 project analysis. The analysis of benefit comparison is done using the following format and the analysis guide presented in the Benefit Assessment System for User Cost Savings (if project produces user benefits). Table 8 and 9 indicate the annual discounted net benefit streams (in Million Birr) and Percent change in users benefit analysis.

**Table 8 Annual Discounted Net Benefit Streams in Million Br**

Year	Construction of 24152km to Earth Road or PSNP earth Road Standard 3.3mt width			Construction of 24152km to PSNP Standard 30% gravel surfaced 3.3mts width			Construction of 24152km to all weather URRAP Standard using the low volume manual to average 5.5 to 5.8 mt width		
	MT VOC Million Br	MT Time Million Br	Total Net Benefits Million Br	MT VOC Million Br	MT Time Million Br	Total Net Benefits Million Br	MT VOC Million Br	MT Time Million Br	Total Net Benefits Million Br
2014	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018	-31.38	-3.22	-34.60	39.34	-1.36	37.98	766.05	22.29	788.33
2019	-35.40	-3.11	-38.51	25.62	-1.44	24.18	890.21	29.75	919.96
2020	-38.16	-3.01	-41.16	2.33	-1.46	0.87	686.93	29.90	716.84
2021	-39.94	-2.90	-42.84	-25.29	-1.50	-26.79	473.21	29.79	502.99
2022	-40.96	-2.80	-43.76	125.37	-1.23	124.14	481.30	29.19	510.49
2023	-41.40	-2.70	-44.10	122.65	-1.21	121.44	473.79	28.63	502.41
2024	-41.40	-2.60	-44.00	119.97	-1.18	118.79	458.82	28.08	486.90
2025	-41.05	-2.50	-43.56	117.33	-1.16	116.17	440.43	27.55	467.98
2026	-40.45	-2.41	-42.86	114.73	-1.14	113.59	420.58	27.04	447.62
2027	-39.66	-2.32	-41.98	112.17	-1.11	111.06	400.26	26.53	426.79
2028	-38.73	-2.24	-40.97	109.65	-1.09	108.56	379.92	26.04	405.96
<b>Total:</b>	<b>-428.54</b>	<b>-29.81</b>	<b>-458.35</b>	<b>863.88</b>	<b>-13.88</b>	<b>850.00</b>	<b>5,871.50</b>	<b>304.79</b>	<b>6,176.29</b>

**Table 9 User Cost Savings**

<b>User Cost Savings (If project produces user benefits)</b>						
Savings Area	Applicable (0 = No; 1 = Yes)	Discounted Costs (Million Br)		Differential	Discounted Costs (Million Br)	Differential
		Cost With Use of Research Product	Without Use of Research Product		Without Use of Research Product	
		Constructi on of 24152km to all weather URRAP Standard using the low volume manual to average 5.5 to5.8 m width	Constructio n of 24152km to Earth Road or PSNP earth Road Standard 3.3m width		Construction of 24152km to PSNP Standard 30 percent gravel surfaced 3.3m width	
Vehicle Operating Cost	1	5871.52	-428.54	6300.06	863.88	5007.64
Travel and transportation cost	1	304.79	-29.80878	334.60	-13.878906	318.67
Crash costs	0					
Annual User Costs (13)		6176.31	- 458.352256	6634.66	850.005056	5326.31
<b>Percent change</b>				<b>107.4%</b>		<b>86.2%</b>

The analysis confirms and proves that:

- The construction of 24,152km all-weather URRAP Standard roads having an average width of 5.5 to 5.8m has a calculated benefit of **107.4 percent** for users compared to the option of construction of the 24,152km of Earth Road or PSNP earth Road Standard with 3.3m width; and
- The construction of the 24152km all-weather URRAP Standard roads having average width of 5.5 to 5.8m has a calculated benefit of **86.2 percent** for users compared to the option of construction of the 24,152km PSNP Standard road with provision of 30 percent gravel surface of 3.3m road width.

Hence, this leads to a conclusion that use of the Low Volume Manual for the construction of URRAP roads has 86.24 percent to 107.42 percent or an average 97.08 percent benefit for users compared to the two counterfactual options considered above.

The overall score of outputs and outcome achievement, benefits assessment and Impact analysis of the collaborative research projects with ReCAP research output and usage, including cost benefit analysis, are summarised below. It is considered after weighting the average aggregate subsystem, as well as evaluating achievement, benefits and Impact analysis as shown in Table 10 and in Annex 2.



**Table 10 Overall Score for Collaborative Research Projects with ReCAP Research Output**

Part	Performance indicator	Score in %	Rating	Remark
A	Research output and usage	84	Excellent	Six research projects and one technical support project
B	Economic /cost savings	97	Excellent	
C	Socio-economic	80	Excellent	Gender Mainstreaming in Rural Road Construction in Ethiopia: Impacts and Implications. The performance is in fair range. Since the handbook and guides are recently completed and adapted by ERA for use. It is too early to see the impact on the ground.
C	Safety			
E	Environmental	80	Excellent	One project of climate adaptation handbook, climate threats and vulnerability assessment guidelines, Engineering Adaptation guidelines, and change. The performance is in fair range. Since the handbook and guides are recently completed and adapted by ERA for Use. It is too early to see the impact on the ground.
F	User satisfaction	83	Excellent	

The overall weighted average combined achievement is 84.8percent and is in the rating category of Excellent. Therefore:

- **As per the Benefits Assessment Framework:** Overall weighted average combined achievement is 84.8 percent and is in the rating category of Excellent;
  - **As per the log frame IMPACT WEIGHTING Component (40 percent):** The weighted average achievement is 34 percent which is also in the rating category of Excellent.
- C. In-house road research projects in ERA/RRC and Collaborative research with Research Collaborators other than ReCAP**

The RRC has been working in its Kality temporary research facility since June 2014. The research activities being carried out in-house in ERA/RRC are currently at different stages and most of the trial construction (where needed) is completed and under monitoring.

From the 36 projects for in-house capacity building and the road research projects, the research work of 18 projects is completed and the research outputs of 7 projects have already been moved to the implementation stage: the remaining 18 research projects are ongoing. The 7 projects of which the research output implementation is ongoing are:

- A guideline for the establishment and monitoring of sections on the road network to measure Long-Term Pavement Performance (LTPP);
- Assessment of performance and feasibility of rigid pavements in Ethiopia;
- Best practice manual development on thin bituminous surfacing;
- Causes of cost and time overrun on ERA road construction projects;
- Constructability of surface treatments in Ethiopia;
- Improving performance of Rhyolite wearing course and low-cost surfacing in Ethiopia southern region; and
- Reliability assessment of design practice: Road design projects in Ethiopia.

The manuals, and guidelines are currently used as guidelines for supporting and strengthening the implementation of the ongoing road sector programs under the federal roads (ERA), regional and woreda rural roads.

**OUTPUT 2** of the log frame is related to the building of sustainable capacity to carry out research on low volume rural roads and rural transport services in Ethiopia/RRC. The assessment is carried out on the performance reviewed based on:

*i. In-house capacity building and road research projects*

The government has put a great emphasis in conducting road and related research projects so as to support the road sector development in Ethiopia. With this objective, a dedicated department of Research and Development Directorate has been established under ERA/ RRC since 2010 to deliver the intended results. Temporary research facilities have been in place with skeletal staffing that are required to carry out the task. Under this effort, RRC has completed 18 research projects of 36 in-house research projects that have been initiated, of which seven moved to implementation stage.

*ii. The Collaborative research with other partners than ReCAP includes:*

- a) Research on four collaborative projects other than with ReCAP is complete; two concerning capacity building & technical assistance and the other two concerning research projects. Three out of the four projects have moved to implementation stage and the remaining research project is completed but implementation has not started yet.
- b) The RRC is also working in six technology transfer projects with various organizations. Most of them are associated with earth reinforcing, soil stabilization and bitumen modification. These projects are not yet completed.

The status of the 46 of in-house road research projects in ERA/RRC and collaborative research with other partners than ReCAP shows that ten projects have already moved to implementation stage, 19 research projects are completed and the research on the remaining 17 projects is ongoing (Annex 2).

The Logframe output indicators; Output Indicator 2.1 and Output Indicator 2.3 shown below relate to the building of sustainable capacity to carry out research on low volume rural roads, and rural transport services in Ethiopia/RRC. The assessment of the performance in respect of each indicator is as shown below and in Annexes 1 and 2:

**Output Indicator 2.1:** Research capacity: the number of research projects undertaken by RRC taking lead roles is 46, consisting of:

- 4 projects of capacity building Technical Assistance in collaboration with JICA1, World Bank and MetaMeta
- 6 projects of technology transfer in collaboration with different technology transfer groups
- 36 in-house projects for capacity building and project research

In addition to the above the RRC has carried out or is managing the following:

- Five annual conferences held with 43 presentations and sharing of experience and knowledge
- 2 projects in collaboration with Addis Ababa University;
- 1 project in collaboration with Mekele University
- 1 project in collaboration with Bahirdar University -collaborative works with RRC

**Output Indicator 2.2:** Number of research projects managed through National Research Centres RRC and supported by ReCAP funding for technical assistance and capacity building: operational-initiating, carrying out and producing papers from research projects. The number of projects, which are done in collaboration with ReCAP, is nine.

**Output Indicator 2.3:** Number of research projects with female researcher inputs at senior technical level:

Projects done by female researchers are as follows:

- Claim analysis
- Impact of budget allocation on Road Asset Management (RAM)
- Analysis of contractor's performance
- Management of research projects from year 2011 till 2013

The finding of the outputs and outcome of in-house road research projects in ERA/RRC and collaborative research with other partners than ReCAP is evaluated. The achievement, benefits assessment and Impact analysis of the Overall Score for Collaborative Research Projects with ReCAP Research Output and Usage is summarised by considering the weighting average aggregate finding of the subsystem. The findings of achievement, benefits and impact analysis are shown in table 11 and in Annex2.

**Table 11 Overall Score for In-house Road Research Projects in ERA/RRC and Collaborative Research with Other than ReCAP Research Collaborators**

Part	Performance indicator	Score in %	Rating	Remark
A	Research output and usage In-house Projects	69	Good	The research projects are recently completed and moved to Implementation
B	Economic /cost savings	-	-	
C	Socio-economic	-	-	
D	Safety	-	-	The projects are at starting stage
E	Environmental	80	Excellent	Development of landslide countermeasure guideline, Landslide Handbook for road engineers and Method for increasing the use of locally available materials for road construction in Ethiopia by allowing for climate variations.
F	User satisfaction	40	Poor	Since the research outputs are recently moved to implementation it is too early to get enough justification on user satisfaction

The overall weighted average combined achievement is 62.9 percent and is in rating category of Good. Therefore:

- **As per Benefits Assessment Framework:** overall weighted average combined achievement is 63 percent and is in rating category of Good, and;
- **As per the log frame IMPACT WEIGHTING Component (25 percent):** Weighted average achievement is 16 percent which is also in a rating category of Good.

#### 4.4.3 Knowledge Generated Evidence (Output 3)

The logframe related to Knowledge Generated requires an evidence base of LVRR and transport services knowledge being widely disseminated and easily accessible by policy makers and practitioners (including education and training institutions). The assessment is carried out on the performance review based on:

**Output Indicator 3.1:** Research centres in partner countries are linked to an electronic repository for rural transport knowledge.

- Efforts are being made to link to International Knowledge database (through AFCAP)
- Link to Rural Access Library on the ReCAP website is done but not fully functional and the ERA RRC is attempting to improve it

**Output Indicator 3.2:** ReCAP generated knowledge is presented and discussed at high level international development debates and conferences:

Ethiopia is a member:

- ARTReF: African Road and Transport Research Forum which has 14 member countries; Ethiopians' delegate is vice president of ARTReF
- AFCAP/ReCAP Steering group Member

The following research outputs are published in International Journals:

- Method for increasing the use of locally available materials for road construction in Ethiopia by allowing for climate variations optimized approach to road design (Otto, A. Endale, A. and Greening, P.A.K. (2015). Available at: <https://doi.org/10.3141/2474-13> [Accessed 26 July. 2020])
- Assessment of Foamed Bitumen performance on Ambo Gedo (Otto, A. and Endale, A. (2015). Available at: <https://trid.trb.org/view/1404823> [Accessed 26 July. 2020])
- Can Humans Predict the Future: Consequences of Inaccurate Traffic prediction (Endale, A.; Otto, A. and Melaku, A. (2016). Available at: [http://www.research4cap.org/Library/Endaleetal\\_2016\\_CanHumansPredictFutureTrafficForecasting\\_iTRARR\\_v160314.pdf](http://www.research4cap.org/Library/Endaleetal_2016_CanHumansPredictFutureTrafficForecasting_iTRARR_v160314.pdf). [Accessed 26 July. 2020])
- Common surface defects in asphalt road pavements and unexpected causes (Rolt, J. Otto, A. (2020). Available at: <https://www.icevirtuallibrary.com/doi/10.1680/jtran.17.00088>. [Accessed 26 July. 2020])
- Engineering geology of cinder gravel in Ethiopia: Prospecting, testing and application to low volume roads (Hearn, G.J., Otto, A., Greening, P.A.K. et al. (2018). Available at: <https://doi.org/10.1007/s10064-018-1333-3>. [Accessed 26 July. 2020])

**Output Indicator 3.3:** ReCAP generated knowledge disseminated through dedicated training and workshops, virtually or physical, that is positively rated by participants.

- The conference papers of 43 presentations and documents from the five annual conferences held, presentation and experience and knowledge sharing made on the conference with the participants whereby most of them are in house and invited guests,
- Based on the common agreements on the MOU signed with local government universities, ERA sponsored MSc students to work on their theses on prioritized and identified thematic areas by RRC, RRC Research Managers being adviser/co-adviser for MSc students,

The overall weighted average rating for Output 3 of the log frame related to Knowledge Generated evidence was considered by taking the average overall score obtained based on benefit analysis framework for:

- Collaborative Research Projects with ReCAP: 84.8 percent
- In-house road research projects in ERA/RRC and Collaborative research with Other than ReCAP Research Collaborators: 62.9 percent

Based on this assumption the overall weighted average rating for Output 3 of the log frame related to Knowledge Generated evidence is:

- **As per Benefits Assessment Framework:** Overall weighted average combined achievement is 74 percent and is in rating category of Good, and;
- **As per the log frame IMPACT WEIGHTING Component (20 percent):** Weighted average achievement is 15 percent which is also in a rating category of Good.

#### 4.4.4 User Satisfaction Rating using Benefits Assessment Framework

In addition to the above findings, the consultant further rated the user satisfaction by using the principles and guidance provided in the Benefit Assessment System (BAS) document. According to the document the following performance measures, which includes awareness, use and value of research products, are

considered to directly address the users' satisfaction with the research products. Users include local and national road agencies and sometimes, international bodies, and ultimately the travelling public.

User satisfaction metrics assess the extent to which users are satisfied by the choice of projects undertaken by the staff, timeliness and accuracy of research products, applicability of research to user problems, responsiveness to requests for technical assistance, and quality of research products. A scale of 1 to 5 is used to indicate the level of satisfaction (1 being least and 5 being best). All measures are equally important and therefore are weighted equally as per the following overall rating scale and scoring.

### Rating Scale

Score > 75 percent – Excellent: Meets users' needs adequately

60percent < Score ≤ 75 percent – Good: Meets users' needs satisfactorily

45percent < Score ≤ 60 percent – Fair: Limited users' satisfaction

Score < 45 percent – Poor – Users not satisfied with research product.

Accordingly, the rating of the user agencies is calculated as shown in Table 12. The overall scoring is based on the contacted respondents from the federal road agency (i.e. ERA RRC), regional and woreda road and transport offices, including public on the visited regions and woredas. The indicative overall rating of the consulted stakeholders confirms the evidence that they benefit from the ReCAP supported research works.

**Table 12 User Satisfaction Rating**

User Groups	Rating in %	Rating Category
User satisfaction rating by Regional Road Authorities (Oromia and SNNPRS)	78.9	Excellent: Meets users' needs adequately
User satisfaction rating from Sample Woredas (Oromia and SNNPRS)	77.8	Excellent: Meets users' needs adequately
User satisfaction Rating Response on the Questioners distributed to Federal Road Agency (RRC)	89.3	Excellent: Meets users' needs adequately
<b>Average Rating</b>	<b>82.0</b>	<b>Excellent: Meets users' needs adequately</b>

### **OUTPUT 4: ReCAP programme is effectively and efficiently managed**

Since Output 4 is an internal logframe indicator between Cardno and DFID on which the partner institution has no major influence on the performance rating; the original output 4 is substituted and the evaluation is carried out using user satisfaction rating component of BAS using the 15 percent weighting. Hence, the rating is done accordingly with the result shown in Table 12 above.

Therefore, the overall weighted average combined achievement is shown as follows:

- **As per Benefits Assessment Framework:** overall weighted average combined achievement is 82 percent and is in rating category of excellent and;
- **As per the log frame IMPACT WEIGHTING Component (15 percent):** Weighted average achievement is 12.3 percent which is also in a rating category of excellent.

### **4.5 Overall Impact and Performance Rating**

The overall weighted average combined achievement of all the in-house and collaborative researches as measured by using the benefits assessment framework and logframe weighted ratings are , 75.75 and 77.3

percent respectively, which both are in the rating category of excellent. The overall combined rating made as per benefits assessment framework and logframe are summarized in table 13 below.

**Table 13: Overall Rating**

	Benefits Assessment Framework%	The proportion in terms of the logframe impact weighting %
Output 1	84	34
Output 2	63	16
Output 3	74	15
User satisfaction (alternate to Output 4)	82	12.3
<b>Overall Rating</b>	<b>75.75%</b>	<b>77.3%</b>

## 5 Conclusions

From the analysis that was carried out, one can conclude that the ReCAP supported projects contributed significantly to achieving the desired positive impacts. Of the nine ReCAP supported research projects, eight are already at the implementation stage and the remaining one, concerning performance monitoring of trial section (i.e Long Term Pavement Performance (LTPP)), is ongoing. This shows that the ReCAP projects are managed successfully and the expected results are achieved.

Furthermore, the overall ratings as per the defined indicators and weightings that are presented in the Benefit Assessment Framework and ReCAP logframe confirm the contribution and achievement as follows:

- As per Benefits Assessment Framework: the overall weighted average combined achievement is 75.75 Percent and is in rating category of Excellent and;
- As per the log frame IMPACT WEIGHTING Component: the weighted average achievement is 77.3 percent which is equally in a rating category of excellent.

The study of overall achievement proves that the ReCAP research contribution was playing a notable role in the road sector development through the updating of the design manuals, specifications, guidelines, gender and environment related handbooks and guides, etc. in addition to the institutional capacity building of RRC.

According to user satisfaction survey and findings it is confirmed that users are satisfied with the research outcomes. The contacted respondents from the federal road agency (i.e. ERA RRC), regional and woreda road and transport offices, including public in the visited regions and woredas; confirmed the benefits obtained. The e consulted local communities also confirmed the above findings and the benefits obtained from the ReCAP supported research.

Although the maintenance and sustainability issues of the road infrastructure are persisting and a high staff turnover from the Road Research Centre remain to be a challenge; the ReCAP contribution would bring more benefit in the future should there be an extension or continuation of the programme.

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## Annex 1 Log Frame

Project Name			Baseline (July 2014)	(July 2014 to 2020)
<b>Impact:</b>	<b>Impact indicator 1:</b>			
Increased low volume rural road and transport services as well as safe and reliable access in Ethiopia are improving livelihoods of poor men and women and improving economic growth.	The percentage of the rural population in Ethiopia who live within two kilometres of an all-season road (RAI: Rural Access Index);	<b>Ethio pia</b>	<b>43%</b>	<b>69%</b>
	<b>Impactindicator2:</b>			
	Rural transport premium (fares per passenger-kilometre on LVRR relative to fares on long-distance bus services) tracked in three focus countries.			<ul style="list-style-type: none"> <li>According the 22 years of RSDP, the total Average Annual Daily Vehicle Kilometres has increased from 17.3 million in 2014/15 to 27.1 in 2017/18</li> <li>The trends over twenty years (1996/97 to 2017/18) shows that average vehicle operating cost index (Index A) had risen from 100 in 1996/97 (base year) to 941.51 in 2017/18, an increase by over 841 percent compared to the base year and an annual growth of 11.27 percent.</li> </ul> <p>Though no direct measurement of the impact was possible, from the expansion of the network and the above mentioned increase the impact in this regard is considered positive.</p>
<b>OUTCOME</b>	<b>Outcome Indicator 1</b>			
Sustainability i.e. Partner Government and other financiers co-funding research with ReCAP Contribution in kind (K) relates to funding of trial sections, staff time, dissemination and	SUSTAINABILITY: Partner Government and other financiers co-funding research with ReCAP		<ul style="list-style-type: none"> <li>8 projects of the Capacity Building and Cooperative research with AFCAP</li> </ul>	<ul style="list-style-type: none"> <li>Government funding in-house studies of 36 applied research projects and Construction of the Main Road Research Facility;</li> <li>Grants EU for RRC laboratory facilities</li> <li>9 ReCAP</li> <li>One project MetaMeta, JICA two project</li> </ul>
	Contribution in kind (K) relates to funding of trial sections, staff time, dissemination and	Contribution in kind (K) relates to funding of trial sections, staff time, dissemination and training. Core contributions (C) relates to funding of research programme core costs, research contracts, capacity building and knowledge management		
	<b>Outcome indicator 2:</b>			

Project Name			Baseline (July 2014)	Baseline (July 2014 to 2020)
<p>training. Core contributions (C) relates to funding of research programme core costs, research contracts, capacity building and knowledge management</p>	<p>Concrete examples of change (applied or formally adopted), influenced by ReCAP research that will be applied to kilometres of road in Ethiopia;</p>			<p>Construction of :</p> <ul style="list-style-type: none"> <li>• Main roads 4000km</li> <li>• Regional rural roads 10011.8km</li> <li>• URRAP Worreda Road 24152km of which 633km are AGP roads built to URRAP standard</li> </ul> <p>According the study report of the Review of Ethiopian Rural Roads Program document which was published in May 2018, the following findings has been observed:</p> <ul style="list-style-type: none"> <li>• An average decrease in travel time to the nearest town of 30 minutes (around 20%) since 2010;</li> <li>• An increase in the Rural Accessibility Index from 46 in 2010 to 52 in 2016, meaning an additional 3.6 million people were brought within 2 kilometres of an all-weather road;</li> <li>• Overall, 25 percent of kebeles have significantly increased their Market Accessibility Index ;</li> <li>• Increasing household welfare by 23 percent between 2012 and 2016 ;</li> <li>• Households with greater than 120 minutes travel time to the nearest town after connection with rural roads increased household consumption by around 34 percent between 2012 and 2016 ;</li> <li>• Strengthening resilience to drought shocks ;</li> <li>• Widening the opportunity for the economic base for communities ;</li> <li>• More women (3.6 percentage points) and the youth (7.9 percentage points) took wage jobs.</li> </ul>
	<p><b>Outcome Indicator 3</b></p> <p>Number of citations in academic articles of ReCAP articles and/or working papers, conference papers etc.</p>			<p>The RRC has conducted 5 annual Conferences since June 2014 on research projects. List of summarized Thematic Areas and Number of Presentation and Discussion Areas Covered on each of the Annual Conference Researches, type of documentation and status are presented in the RRC research status report. On the 5 annual conferences held since June 2014 on research projects the proportion of type of documentation and status presented by the In-house Researcher/Presenter and Invited Researches on 10 Thematic Research Areas are:</p>

Project Name			Baseline (July 2014)	(July 2014 to 2020)
				<ul style="list-style-type: none"> <li>• 3 Abstracts and Power point type of documentation and its status presented by In-house Researcher/Presenter</li> <li>• 16 total Full Paper and Power point type of documentation and its status presented by In-house Researcher/Presenter</li> <li>• 5 Abstracts and Power point type of documentation and its status presented by Invited Researches</li> <li>• 19 total Full Paper and Power point type of documentation and its status presented by Invited Researches</li> </ul> <p>The above proportion of presentation by in In-house Researcher/Presenter shown above indicates the capacity of the in-house researcher is growing.</p> <p>The proportion of distribution of presentation the 43 presentation on the annual conference among the 10 thematic areas are:</p> <ul style="list-style-type: none"> <li>• 1 Beneficiary assessment of Rural Access</li> <li>• 7 Construction Management</li> <li>• 1 Highway Design</li> <li>• 1 Landslide</li> <li>• 1 Landslide and geotechnical</li> <li>• 2 Material Database</li> <li>• 17 Material Pavement</li> <li>• 4 Pavement material</li> <li>• 1 Road Construction (Paved)</li> <li>• 8 Transport Engineering</li> </ul> <p>It can be understood that the conference has created a good environment for knowledge sharing from the In-house Researcher/Presenter and by Invited Researches. In addition it is observed from the status of the conference paper coverage that the higher coverage was made on the conference presentation on material pavement, transport engineering and construction management 17, 8 and 7 Out of the 43 presentations.</p>

Project Name			Baseline (July 2014)	(July 2014 to 2020)
				<p>Also Published research projects are:</p> <ul style="list-style-type: none"> <li>• Environmentally optimized approach to road design (TRB, USA, 2015)</li> <li>• Assessment of Foamed Bitumen performance on Ambo Gedo (CAPSA15, South Africa, 2015)</li> <li>• Can Humans Predict the Future: Consequences of Inaccurate Traffic prediction (Kenya, 2016)</li> <li>• Impact of Road Condition on Rural Transport Services (T2, Zambia, 2017)</li> <li>• Engineering geology of cinder gravel in Ethiopia: Prospecting, testing and application to low volume roads (Springer Nature; July 2018; Bulletin of Engineering Geology and the Environment)</li> </ul>
<b>OUTPUT 1</b>	<b>Output Indicator 1.1</b>			
RESEARCH and UPTAKE: Generation, validation and updating of evidence for effective policies and practices to achieve safe, all-season, climate-resilient, equitable and affordable LVRR and transport services.	LVRR: Number of peer reviewed papers generated from ReCAP supported or related LVRR research projects made available in open access format			On www.era.gov.et Ethiopian Roads Authority website: <ul style="list-style-type: none"> <li>• climate adaptation handbook,</li> <li>• Final Review and Completion of Specifications and Standard Drawings,</li> <li>• Feedback and Dissemination Workshop for revised ERA 2013 Manuals and</li> <li>• Specification, Low Volume Roads Manuals,2016(Part A,B,C,D,E,F) and</li> <li>• Gender Mainstreaming in Rural Road Construction in Ethiopia</li> </ul>
	<b>Output Indicator 1.2</b>			
	TS::Number of peer reviewed papers generated from ReCAP supported or related transport services research projects made available in open access format.			
	<b>Output Indicator 1.3</b> ENGINEERING RESEARCHES: National policies, manuals and guidelines and document outputs fully incorporated into Government/Ministerial requirements, specifications and recommended good practice that have been modified or introduced as a result of ReCAP engineering research	•		On www.era.gov.et Ethiopian Roads Authority website: <ul style="list-style-type: none"> <li>• climate adaptation handbook,</li> <li>• Final Review and Completion of Specifications and Standard Drawings,</li> <li>• Feedback and Dissemination Workshop for revised ERA 2013 Manuals and</li> </ul>

Project Name			Baseline (July 2014)	(July 2014 to 2020)
	(including climate change adaptation Ethiopia) Ownership.			<ul style="list-style-type: none"> <li>• Specification, Low Volume Roads Manuals,2016(Part A,B,C,D,E,F) and</li> <li>• Gender Mainstreaming in Rural Road Construction in Ethiopia</li> </ul>
	<b>Output Indicator 1.4</b>			
	TRANSPORT SERVICES RESEARCHS: National policies, regulations and/or practices for rural transport services modified or introduced as a result of ReCAP research (including road safety and gender and Ethiopia).			<ul style="list-style-type: none"> <li>• No such work is done</li> </ul>
	<b>Output Indicator 1.5</b>			
	Cost Benefit Analysis conducted to determine cost effectiveness of the solutions proposed based on ReCAP research, conducted on a whole of life road cost basis.			<p>To date ReCAP has expended bout £976,826 in Ethiopia. However, the benefit obtained from ReCAP research projects has been extremely high when compared with the cost spent so far in Ethiopia. The following points, but not limited to, can justify or describe qualitatively the benefits attained under ReCAP researches.</p> <ul style="list-style-type: none"> <li>• The introduction of low volume manuals has highly contributed for the reduction of cost of construction like URRAP roads in place of using the previously existing design manual in ERA. These URRAP roads have been considerably expanded the road network/density and greatly benefited the country.</li> <li>• The performance monitoring of trial sections like Otta seal surfacing options and lateritic base have contributed a lot in addressing the importance and durability of naturally occurring local materials instead of using crusher plants to obtain crushed materials.</li> <li>• Abundantly and locally available cinder gravel for different applications of road construction has been introduced to relevant stakeholders through workshops and provided guidelines for the same. Further, this has a significant contribution towards reduction of cost of transporting materials from far distance, crushing the parent rocks, minimized construction time, environmental effects, etc.</li> <li>• ReCAP has played a vital role by signing a Memorandum of Understanding towards the technical assistance in establishment of main facility of RRC and enhancement</li> </ul>

Project Name			Baseline (July 2014)	Baseline (July 2014 to 2020)
				<p>of institutional capacity of ERA in conducting collaborative and in-house studies to support the development of the road sector. This can be seen from the ground that the capacity of RRC in ERA has been improved from time to time.</p> <ul style="list-style-type: none"> <li>The developed handbooks and guidelines under climate adaptations has shown cost-effective means of engineering and non-engineering adaptations to environmentally susceptible areas for paved and unpaved types of low volume roads.</li> </ul> <p>Therefore, the benefit of ReCAP contributions is highly remarkable and incomparable with the incurred cost in Ethiopia under ReCAP as this can be proved from the above given facts. Without the involvement and contribution of ReCAP it has been unquestionably reasoned out that the aforementioned advantages and assistance, but not limited to, have been difficult to realize on the road sector.</p>
<b>IMPACT WEIGHTING (%)</b>	<b>Output Indicator 1.6</b>			
40%	LVRR and TS information generated for dissemination, and disseminated, that is not peer reviewed.			
<b>Output 2</b>	<b>Output Indicator 2.1</b>			
<p><b>Capacity Building:</b> The building of sustainable capacity to carry out research on low volume rural roads, and rural transport services in Ethiopia.</p>	<p>Research capacity: Proportion of research projects undertaken by country-based institutions taking lead roles;</p>			<ul style="list-style-type: none"> <li>4 projects of capacity building Technical Assistance in collaboration with JICA1, World Bank and MetaMeta</li> <li>6 projects of technology transfer in collaboration with different technology transfer groups</li> <li>36 in-house projects of capacity building and project research</li> <li>The five annual conference held and on which 43 Presentation and Experience and Knowledge Sharing made Status</li> <li>2 projects in collaboration with Addis Ababa University;</li> <li>1 project in collaboration with Mekele University</li> <li>1 project in collaboration with Bahirdar University collaborative works with RRC</li> </ul>
	<b>Output Indicator 2.2</b>			

Project Name			Baseline (July 2014)	(July 2014 to 2020)
	Number of research projects managed through National Research Centres and supported by ReCAP funding for technical assistance and capacity building,			<ul style="list-style-type: none"> <li>The numbers of projects are the 9 projects of in collaboration with ReCAP and other</li> </ul>
<b>IMPACT WEIGHTING (%)</b>	<b>Output Indicator 2.3</b>			
<b>25%</b>	Number of research projects with female researcher inputs at senior technical level.			<p>Projects done by female researchers:</p> <ul style="list-style-type: none"> <li>claim analysis</li> <li>impact of budget allocation on RAM</li> <li>Analysis of contractor's performance</li> <li>Management of research projects from year 2011 upto 2013</li> </ul>
<b>Output 3</b>	<b>Output Indicator 3.1</b>			
<b>Knowledge:</b> Generated evidence base of LVRR and transport services knowledge is widely disseminated and easily accessible by policy makers and practitioners (including education and training institutions).	Research centers in partner countries are linked to an electronic repository for rural transport knowledge.			<ul style="list-style-type: none"> <li>Efforts made to link to International Knowledge database (through AFCAP)</li> <li>Link to AFCAP database</li> </ul>
	<b>Output Indicator 3.2</b>			
	ReCAP generated knowledge presented and discussed at high level international development debates and conferences			<p>Ethiopia is a member:</p> <ul style="list-style-type: none"> <li>ARTReF: African Road and Transport Research Forum which has 14 members' countries</li> <li>Ethiopians' delegate is vice president of ARTReF</li> <li>AFCAP/ReCAP Steering group Member</li> </ul> <p>The following Research Outputs are published on International Journal:</p> <ul style="list-style-type: none"> <li>Method for increasing the use of locally available materials for road construction in Ethiopia by allowing for climate variations (optimized approach to road design (TRB, USA, 2015)</li> <li>Assessment of Foamed Bitumen performance on Ambo Gedo (CAPSA15, South Africa, 2015)</li> <li>Can Humans Predict the Future: Consequences of Inaccurate Traffic prediction (Kenya, 2016)</li> <li>Impact of Road Condition on Rural Transport Services (T2, Zambia, 2017)</li> </ul>

Project Name			Baseline (July 2014)	(July 2014 to 2020)
				<ul style="list-style-type: none"> <li>• Common surface defects in asphalt road pavements and unexpected causes.</li> <li>• Engineering geology of cinder gravel in Ethiopia: Prospecting, testing and application to low volume roads</li> </ul>
<b>IMPACT WEIGHTING (%)</b>	<b>Output Indicator 3.3</b>			
20%	<ul style="list-style-type: none"> <li>• ReCAP generated knowledge disseminated through dedicated training and workshops, virtually or physical, that are positively rated by participants.</li> </ul>	•		<ul style="list-style-type: none"> <li>• The conference paper of 43 Presentation and document on the five annual conference held Presentation and Experience and Knowledge Sharing made on the conference with the participates</li> <li>• Based on the common agreements on the MOU signed is, ERA sponsored MSc students to work their thesis on prioritized and identified thematic areas by RRC, RRC Research Managers being adviser/co-adviser for MSc students,</li> </ul>
<b>Output 4:</b>	<b>Output Indicator 4.1</b>			
ReCAP Programme is effectively and efficiently managed.	Steering Committee and Executive Committee Approval of ReCAP Work plans.			<ul style="list-style-type: none"> <li>• 9 projects of Collaborative Research Projects with ReCAP, from which the 8 projects research outputs are already, moved to implementation stage and on the remaining one project the research ongoing</li> </ul>
<b>IMPACT WEIGHTING (%)</b>	<b>Output Indicator 4.2:</b>			
15%	Accuracy of financial forecasts			<ul style="list-style-type: none"> <li>• The projects are completed within the budget.</li> </ul>



## Annex 2 Impact and Benefit Assessment

### Part A – Research Product and Usage Indicators

#### a) Collaborative Projects

Item No	Project Plan Type/Group	Project/Research Name	Thematic Area	Counterpart Name	Research Status	Implementation status of the research output	Overall rating of Research Product and Usage Indicators	
							Score (%)	Rating
1	Development of pavement design standards and specifications	Final Review and Completion of Specifications and Standard Drawings	Design and Specification	Collaborative with Recap	Completed Research project	Implemented	100	Excellent
2	Development of pavement design standards and specifications	Feedback and Dissemination Workshop for revised ERA 2013 Manuals and Specification	Design and Specification	Collaborative with ReCAP	Completed Research project	Implemented	100	Excellent
3	Development of pavement design standards and specifications	Low Volume Roads Manuals, 2016 (Part A, B, C, D, E, F)	Pavement Design, construction and maintenance.	Collaborative with ReCAP	Completed Research project	Implemented	100	Excellent
4	Applied Research	Guideline for the Use of Cinder Gravels in Pavement Layers for Low Volume Roads	Pavement Material	Collaborative research with AFCAP	Completed Research project	Implemented	90	Excellent

Item No	Project Plan Type/Group	Project/Research Name	Thematic Area	Counterpart Name	Research Status	Implementation status of the research output	Overall rating of Research Product and Usage Indicators	
							Score (%)	Rating
5	Applied Research	Performance monitoring trial section on: •Natural lateritic gravel base(sub base and base course) DBST , Asphalt concrete and hot rolled asphalt severe condition and a Seal Surfacing (Geado Village, Combel Village)	Pavement Material	Collaborative research with AFCAP	Ongoing Research project	Not applicable	5	Poor
6	Applied Research	Improving the performance of Hot Mix Asphalt Concrete through Refusal Density design: Design and Construction report (AFCAP project)	Hot Mix Concrete Asphalt	Collaborative research with JICA	Completed Research project	Implemented	90	Excellent
7	Establishing Road Research Center	Technical Assistance to RRC to Develop Road Research Capacity	Capacity building	Collaborative with Recap	Completed Research project	Implemented	100	Excellent
						<b>Overall Rating</b>	<b>84</b>	<b>Excellent</b>

**Part E – Environmental Indicators**

**a) Status of Collaborative Research Projects with ReCAP**

Item No	Project Plan Type/Group	Project/Research Name	Thematic area	Counter Part Name	Research status	Implementation status of the research output	Environmental Subsystem						
							Very low	Low	Neutral	Medium	High	Score %	Overall Rating
8	Applied Research	Climate Adaptation: Risk management and resilience optimization for vulnerable road across in Africa (climate adaptation handbook, climate threats and vulnerability assessment guidelines, Engineering Adaptation guidelines, and change management guideline)	Climate Adaptation	Collaborative research with AFCAP	Completed Research project	Implemented					4	80.0	Excellent
<p><b>Ratings :</b></p> <ol style="list-style-type: none"> <li>1. high negative - more than 20% of population negatively impacted (1 point)</li> <li>2. Low - less than 20% of population negatively impacted (2 points)</li> <li>3. Neutral - no noticeable impact (3 points)</li> <li>4. High -less than 20% of population positively impacted (4 points)</li> <li>5. High – more than 20% of population positively impacted (5 points)</li> </ol>													

**Part C – Socioeconomic Indicators**

a) Status of Collaborative Research Projects with ReCAP

Item No	Project Plan Type/Group	Project/Research Name	Thematic area	Counter Part Name	Research status	Implementation status of the research output	Socio-Economic Subsystem						
							Very low	Low	Medium	High	Very High	Score %	Overall Rating
9	Applied Research	Gender Mainstreaming in Rural Road Construction in Ethiopia: Impacts and Implications.	Social	Collaborative research with AFCAP	Completed Research project	Implemented					4	80.0	Excellent

Part E – Environmental Indicators

b) Collaborative research with other collaborators

Item No	Project Plan Type/Group	Project/Research Name	Thematic area	Counter Part Name	Research status	Implementation status of the research output	Environmental Subsystem						
							Very low	Low	Neutral	Medium	High	Score %	Overall Rating
10	Applied Research	Road Water Management Guideline; 'Roads for Resilience: Connecting Roads, Water and Livelihoods' project.	Project management	Collaborative research with MetaMeta	Completed Research project	Implemented					4	80.0	Excellent
11	Applied Research	Increasing climate resiliency of the Ethiopian Road Network	Climate adaptation	Collaborative research with World Bank	Completed Research project	Not Implemented							

Item No	Project Plan Type/Group	Project/Research Name	Thematic area	Counter Part Name	Research status	Implementation status of the research output	Environmental Subsystem						
							Very low	Low	Neutral	Medium	High	Score %	Overall Rating
12	Technical Assistance	Development of landslide countermeasure guideline(design and construction) [through JICA assistance]	Landslide	ERA,RRCCo llaborative research with JICA	Completed Research project	Implemented				4		80.0	Excellent
13	Technical Assistance	Development of Landslide Handbook for road engineers[ through JICA assistance]	Landslide	ERA,RRCCo llaborative research with JICA	Completed Research project	Implemented				4		80.0	Excellent

## Part A – Research Product and Usage Indicators

### a) Collaborative Projects

Item No	Project Plan Type/Group	Project/Research Name	Thematic Area	Counterpart Name	Research Status	Implementation status of the research output	Overall rating of Research Product and Usage Indicators	
							Score (%)	Rating
14	Technology transfer	Nano Cemtech NC Road base Stabilization	Pavement	Collaborative research with GeConSoL	Ongoing Research project	Not applicable	0	Poor
15	Technology transfer	Bio-Enzyme Soil Stabilization	Soil stabilizer	Collaborative research with AASTU	Ongoing Research project	Not applicable	0	Poor

Item No	Project Plan Type/Group	Project/Research Name	Thematic Area	Counterpart Name	Research Status	Implementation status of the research output	Overall rating of Research Product and Usage Indicators	
							Score (%)	Rating
16	Technology transfer	Do-Nou (soil bag) Technology for Soil Stabilization	Soil stabilizer	Collaborative research with AASTU and GL-KU	Ongoing Research project	Not applicable	0	Poor
17	Technology transfer	NovoCrete Soil Stabilization Technology	Soil stabilizer	Collaborative research with Felmar Group	Ongoing Research project	Not applicable	0	Poor
18	Technology transfer	Waste-Plastic (Rubber) substituting bitumen in the Asphalt Mix Design	Pavement and materials	Collaborative research with Mekele University	Ongoing Research project	Not applicable	0	Poor
19	Technology transfer	Geo-grid for Asphalt Reinforcement in Road Maintenance	Pavement and materials	Collaborative research with TENSAE International	Ongoing Research project	Not applicable	0	Poor
<b>b) In-house researches</b>								
20	Establishing Road Research Center	Construction of the Main Road Research Facility	Capacity building	ERA/Road Research	Ongoing Project	Not Applicable	35	Poor
21	Applied Research	Analysis of contractor performance in road construction and maintenance	Construction Management	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor

Item No	Project Plan Type/Group	Project/Research Name	Thematic Area	Counterpart Name	Research Status	Implementation status of the research output	Overall rating of Research Product and Usage Indicators	
							Score (%)	Rating
22	Applied Research	Constructability of surface treatment in Ethiopia	Road Construction (Paved)	ERA/Road Research	Completed Research project	Implemented	50	Fair
23	Applied Research	Evaluation of lime and RHA stabilization techniques to improve expansive sub-grades in Ethiopian road projects	Material Pavement	ERA/Road Research	Completed Research project	Not Implemented	25	Poor
24	Applied Research	Causes and Remedial measures of asphalt concrete pavement damages	Material Pavement	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor
25	Applied Research	Claim analysis and approval practices: case study of Ethiopian federal road projects	Construction Management	ERA/Road Research	Ongoing Research project	Not Applicable	50	Fair
26	Applied Research	Correlation between dynamic cone penetrometer and laboratory California bearing ratio for different type of soil in Ethiopia	Material Pavement	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor
27	Applied Research	Development of a national database of natural road construction materials in terms of quality, quantity and location	Material Database	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor
28	Applied Research	Impact of budget allocation on road asset management	Road asset management	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor

Item No	Project Plan Type/Group	Project/Research Name	Thematic Area	Counterpart Name	Research Status	Implementation status of the research output	Overall rating of Research Product and Usage Indicators	
							Score (%)	Rating
29	Applied Research	Reliability Assessment of design practice: Road design projects in Ethiopia	Construction Management	ERA/Road Research	Completed Research project	Implemented	30	Poor
30	Applied Research	Utilization of industrial waste(Bagass ASH) in flexible pavement construction in Ethiopia	Pavement Materials	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor
31	Applied Research	Causes of cost and time overrun on ERA road construction projects	Construction Management	ERA/Road Research	Completed Research project	Implemented	50	Fair
32	Applied Research	Use of waste plastic as bitumen modifier in road pavements	Pavement Material(Asphalt)	ERA/Road Research	Completed Research project	Not Implemented	25	Poor
33	Applied Research	Improving physical characteristics of collapsible soil on the federal road network in Ethiopia: case study	Pavement materials	ERA/Road Research	Completed Research project	Not Applicable	25	Poor
34	Applied Research	Evaluation of stabilization techniques to improve weak sub grade soils: case study of black cotton soil treatment on Ethiopia road project	Pavement materials	ERA/Road Research	Completed Research project	Not Applicable	25	Poor



Item No	Project Plan Type/Group	Project/Research Name	Thematic Area	Counterpart Name	Research Status	Implementation status of the research output	Overall rating of Research Product and Usage Indicators	
							Score (%)	Rating
35	Applied Research	Performance assessment of emulsified cold mix asphalt concrete for low volume roads in Ethiopia phase 1: laboratory performance assessment	Pavement materials	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor
36	Applied Research	Causes and remedial measures for defects on Asphalt concrete surfacing: case of Goha Tsion Dejen Trunk Road	Pavement materials	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor
37	Applied Research	Development of Mechanistic-Empirical pavement design guide in Ethiopia: phase 1: literature review	Pavement materials	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor
38	Applied Research	LTPP(Long Term Pavement Performance Program	highway design(database development)	ERA/Road Research	Ongoing Research project	Not Applicable	0	Poor
39	Applied Research	Assessment of Foamed Bitumen performance on Ambo Gedo (CAPSA15, South Africa, 2015)	pavement materials	ERA/Road Research	Completed Research project	Published On International Journal	25	Poor

Item No	Project Plan Type/Group	Project/Research Name	Thematic Area	Counterpart Name	Research Status	Implementation status of the research output	Overall rating of Research Product and Usage Indicators	
							Score (%)	Rating
40	Applied Research	Can Humans predict the future? Consequences of inaccurate Traffic forecasting	Transport Engineering	ERA/Road Research	Completed Research project	Published On International Journal	50	Fair
41	Applied Research	Impact of Road surface condition on Rural Transport Services	Transport Engineering	ERA/Road Research	Completed Research project	Published On International Journal	50	Fair
42	Applied Research	Best practice manual development on Thin Bituminous surfacing	Surface Treatment	ERA/Road Research	Completed Research project	Implemented	50	Fair
43	Applied Research	Improving performance of Rhyolite wearing course and low-cost surfacing in Ethiopia southern region.	Pavement material	ERA/Road Research	Completed Research project	Implemented	50	Fair
44	Applied Research	Common surface defects in asphalt road pavements and unexpected causes.	Pavement material	ERA/Road Research	Completed Research project	Published On International Journal	50	Fair
45	Applied Research	Engineering geology of cinder gravel in Ethiopia: Prospecting, testing and application to low volume roads.	Pavement Material	ERA/Road Research	Completed Research project	Published On International Journal	50	Fair
46	Applied Research	Assessment of Performance and feasibility of Rigid Pavements in Ethiopia	Design and Construction	ERA/Road Research	Completed Research project	Implemented	25	Poor

Item No	Project Plan Type/Group	Project/Research Name	Thematic Area	Counterpart Name	Research Status	Implementation status of the research output	Overall rating of Research Product and Usage Indicators	
							Score (%)	Rating
47	Applied Research	Modeling of Gravel loss for Unsealed roads	Transport Engineering	ERA/Road Research	Completed Research project	Not Implemented	0	Poor
48	Applied Research	A guideline for the establishment and monitoring of sections on the road network to measure long Term pavement performance (LTPP)	highway design(database development)	ERA/Road Research	Completed Research project	Implemented	50	Fair

**Part C – Safety Indicators**

**a) In-house research**

Item No	Project Plan Type/Group	Project/Research Name	Thematic area	Counter Part Name	Research status	Implementation status of the research output	Safety Subsystem						Score %	Overall Rating
							Very low	Low	Medium	High	Very High			
49	Applied Research	Rumble strip and safety consideration for road geometric design	Road Safety and Transport Engineering	ERA/Road Research	Ongoing Research project	NA	NA	NA	NA	NA	NA	NA	NA	NA

Item No	Project Plan Type/Group	Project/Research Name	Thematic area	Counter Part Name	Research status	Implementation status of the research output	Safety Subsystem						
							Very low	Low	Medium	High	Very High	Score %	Overall Rating
50	Applied Research	Causes and remedial measures of traffic accidents	Road Safety and Transport Engineering	ERA/Road Research	Ongoing Research project	NA	NA	NA	NA	NA	NA	NA	NA
51	Applied Research	Safety consideration in road geometric design to minimize traffic accidents in Ethiopia	Road safety and Transport	ERA/Road Research	Ongoing Research project	NA	NA	NA	NA	NA	NA	NA	NA
52	Applied Research	Economic and social impact of driving behavior and traffic congestion in Addis Ababa	Transport Engineering	ERA/Road Research	Ongoing Research project	NA	NA	NA	NA	NA	NA	NA	NA

**Part E – Environmental Indicators**

**In-house research**

Item No	Project Plan Type/Group	Project/Research Name	Thematic area	Counter Part Name	Research status	Implementation status of the research output	Environmental Subsystem							
							Very low	Low	Neutral	Medium	High	Score %	Overall Rating	
53	Applied Research	Assessment of landslide causes of federal road projects the case of Gohatsion Dejen road project	Landslide	ERA/Road Research	Ongoing Research project	Not Applicable							0.0	Poor
54	Applied Research	Assessment of land slide causes of federal road projects: the case of jimma bonga mizan road project	Landslide	ERA/Road Research	Ongoing Research project	Not Applicable							0.0	Poor
55	Applied Research	Method for increasing the use of locally available materials for road construction in Ethiopia by allowing for climate variations	Environment.	ERA/Road Research	Completed Research project	Published On International Journal			3				60.0	Fair

**Ratings :**

1. high negative - more than 20% of population negatively impacted (1 point)
2. Low - less than 20% of population negatively impacted (2 points)
3. Neutral - no noticeable impact (3 points)
4. High -less than 20% of population positively impacted (4 points)
5. High – more than 20% of population positively impacted (5 points)

### Annex 3: Sample Site Photographs and Discussion Pictures



Oromia Regional State Arsi Negele Woreda



Oromia regional State Bishoftu woreda







የስራው ስም	የስራው አካባቢ	የስራው ዋጋ
1. የግብርና ስራ	E SYሰጠ	3-3
2. ግብርና ስራ	E SYሰጠ	5-8
3. ግብርና ስራ	>> ሰር	4-74
4. ግብርና ስራ	>> ሰር	3-68
5. ግብርና ስራ	>> ሰር	8-52
6. ግብርና ስራ	>> ሰር	9-8
7. ግብርና ስራ	>> ሰር	4-44



SNNP regional State Halaba Woreda



Oromiya regional state, Meki Woreda





SNNP Regional State Sidama Dale Woreda



Discussion with Director ERA Road Research Center

## **Annex 4: Impacts of Design Manuals on LVRR in Ethiopia: A Case of Halaba Woreda of SNNPRS**

### **IMPACTS OF DESIGN MANUALS ON LVRR IN ETHIOPIA: A CASE OF HALABA WOREDA OF SNNPRS**

Halaba Special Woreda is located in the southern Ethiopia in Southern Nations, Nationalities and Peoples Region (SNNPR). In the woreda LVRR are constructed from the year 2012 to 2019 and 348 km and 43km of roads are built under URRAP and Productive Safety Net Programme (PSNP) respectively.

The construction of LVRR has brought significant change and improvement in the livelihood of local communities from economic and social development perspectives. Stakeholders were interviewed from the Woredas and kebeles/villages including community members as well as transporters (Motor bicycle and Bajaj owners and drivers). They reported that the construction of low volume rural roads has made important contribution in improving the livelihood of the local community, economic and business development, transport accessibility, delivery of agricultural inputs and in transporting produces to market centers; and also in facilitating and improving the delivery of social services, such as, Education and Health services.

**Employment opportunities:** increased income and employment is reported to be one of the major economic benefits obtained in the Woreda with job opportunity created to local youth (men and women) during the construction works of the LVRR. The situation before the URRAP program was that several thousand unemployed youths were there with no or little incomes. The temporary employment opportunities have also enabled the youth to obtain new and additional skills. Prior to the construction of the roads, the only available job opportunity at village level for the youth was working in their family farms. In addition to the employment created during the construction of road projects the youth are now able to go and work in the urban centers each day in various works and come back in the evening to stay at their homes. Prior to the construction of the roads, many youth were not able to go and work to the urban centers since they could not be able to come back each day due to lack of transport facilities.

**Sale of agricultural produces:** Prior to the construction of the roads, the only available market for the local community was to sell their agricultural products in the nearby village markets only. However, following the construction of the roads, they were now able to sell their products in the nearby urban centers and fetch a better price. The construction of the roads is found to be highly beneficial in particular to villages that were inaccessible, isolated and located in distant far away from urban centers. Some stakeholders reported that by selling their products to markets located in the urban centers they were able to sell in much higher price (sometimes twice the price) than they used to sell in local markets.

**Increased connectivity:** With the construction of LVRR, several kebeles are now connected to each other and access from one kebele to other has become much easier and takes shorter time compared to the situation before. It is also possible to connect with neighbouring woredas located in other Zonal administrations. For instance, the Chumbula- Gerema road connects with Damboya woreda in Kembta Tembaro Zone and with Hadiya Zone administration.

**Ambulance services along LVRR:** One of the major benefits of LVRR which is highly appreciated and recognized by residents interviewed residing in all the surveyed sample woredas is the introduction and availability of ambulance services. Prior to the road construction of the roads sick people and pregnant women were transported to health facilities on locally made wooden stretchers or beds carried on the shoulder of

people for long hours and even more than a day. Pregnant women and seriously ill persons had difficulties to reach to medical facilities prior to the construction of LVRR and introduction of ambulance services.

The introduction of ambulance services has made significant and important contribution in saving the lives of people and in particular mothers during child delivery. The public highly speak and recognize that if it would not have been for the construction of the LVRR it could have been difficult for them to reach to medical/health facilities that are located in the major towns/cities. Transporting pregnant women and seriously sick patient timely to nearby and distant health facilities has become much easier and the number of deaths in particular mothers due to child delivery is reported to have reduced.

**Educational services:** School children and parents also reported that nowadays they do not worry too much in sending their children to schools that are located in nearby towns. Prior to the construction of the LVRR they were worried to send their young children and in particular girls fearing that they might be raped or abused but now they have less worry since the children do not need to walk long distances in foot and instead, they can use motorbike or Bajaj taxis. Schools have also reported that enrolment rate has increased and in particular the number of girls attending primary schools has also increased and similarly, dropout rate has also reduced since the construction of LVRR. Primary School Teachers also reported to be happy with the road construction and prior to its construction many teachers refuse to go and work in those villages where there are not any roads and transport services.

### **Anecdote**

The following is a story of a young man named Abdella who owns a motorbike and provides a taxi service using his motorbike along Chumbula-Gerema road in Halaba woreda.

Abdella is a young person in his early twenties who is riding a Chinese made Motorbike and provides a taxi service for the last four years. When he noted the construction of URRAP roads that passes through his village and the lack of transport operators along the route, he thought that maybe he could buy a motor bicycle and provide taxi service. He then bought his motorbike with the seed money he got from his families and through a credit facility from a microfinance institution.

“I bought motor bicycles to use as a taxi to transport people from place to place” says Abdella. “Most of the travel is done to the town center. Prior to the construction of the road the only mode of transport was walking on foot and by using pack animals. We carry up to 3 men on our motorbike in one-way trip for a maximum distance of 10 km and we charge 10 Birr for each person. We take maximum care to minimize or avoid accidents mainly by driving slowly”.

There are a number of other youths who ride motor bicycles like him in the area buying them through a loan obtained from micro finance institutions and from their own savings. The construction of the road has enabled them to start different types of businesses, such as, taxi services and earn regular income.



Fig. 1: Abdella and other motor transport Providers