



**ADDIS ABABA UNIVERSITY**  
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**SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING**

**ASSESSMENT OF PERFORMANCE AND CRITICAL SUCCESS**  
**FACTORS OF RURAL ROAD CONSTRUCTION IN SOUTH**  
**ETHIOPIA; A CASE STUDY OF UNIVERSAL RURAL ROAD ACCESS**  
**PROGRAM (URRAP) IN WOLAITA ZONE**

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**BY**

**ADNEW AYSSA**

**ADVISOR – PROF. DR.- ING. ABEBE DINKU**

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The undersigned have examined the thesis entitled ‘**Assessment of Performance and Critical Success Factors of Rural Road Construction in South Ethiopia; A Case Study of Universal Rural Road Access Program (URRAP) in Wolaita Zone**’ presented by **ADNEW AYSSA**, a candidate for the degree of **Master of Science** and hereby certify that it is worthy of acceptance.

_____ Advisor	_____ Signature	_____ Date
_____ Internal Examiner	_____ Signature	_____ Date
_____ External Examiner	_____ Signature	_____ Date
_____ Chair person	_____ Signature	_____ Date

## **UNDERTAKING**

I certify that research work titled ‘Assessment of Performance and Associated Factors of Rural Road Construction in South Ethiopia; A Case Study of Universal Rural Road Access Program (URRAP) in Wolaita Zone’ is my own work. The work has not been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged / referred.

Adnew Ayssa

## ABSTRACT

*Connecting rural areas each other and to main roads is vital for Ethiopia as larger part of its' population are rural dwellers. To accelerate combating of poverty in these areas, Government was working to increase rural road network. The purpose of this research is, therefore, to present the status of performance and associated factors of rural road construction under universal rural road access program in Wolaita Zone. The study has applied three round Delphi questionnaire techniques to adapt the weights of criteria used to measure performance and focus group discussion to group critical success factors in respective categories. Questionnaires were distributed to respondents who have been participating in the projects to rank 0 for least to 3 for highest performance towards each sub criteria of relevance, effectiveness, efficiency and sustainability, which later was composed to calculate the performance. Responses from 78 participants were analyzed and the results show that rural road construction under universal rural road access program in Wolaita Zone is successful by scoring 1.85 out of 3. But in terms of relevance and sustainability, the program is less than successful by scoring 1.52 and 1.21 respectively. Regarding success factors, top twenty critical success factors were identified and five are grouped under Client including 'Timely payment' which is the first critical success factor, the next five and ten are grouped under Consultant and Contractor related critical success factors respectively.*

**Key Words:** *Rural road, Performance, Critical success factors*

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## **LIST OF ABBREVIATIONS**

ADA - Austrian Development Agency

ADB - Asian Development Bank

BOOT – Build Own Operate Transfer

CSA – Central Statistics Agency

CSF – Critical Success Factor

ERA – Ethiopian Roads Authority

GDP – Gross Domestic Product

KERRA – Kenya Rural Road Agency

MDG – Millennium Development Goal

PMGSY - Pradhan Mantri Gram Sadak Yojana

PMS - Pavement Management System

PPPAA – Public Procurement and Property Administration Agency

RII – Relative Importance Index

RRA - Regional Roads Authority

RSDP - Road Sector Development Program

SADC - South African Development Community

SNNPR – Southern Nations, Nationalities and Peoples Regional State

SSA – Sub Saharan African

TQM – Total Quality Management

URRAP - Universal Rural Road Access Program

WRO - Woreda Road Offices

## CHAPTER 1 INTRODUCTION

### 1.1 Background

In the context of Ethiopia and countries like Ethiopia transport, especially road transport plays a vital role in facilitating economic development as per the report named ‘assessment of 15 years performance of Road Sector Development Program’ of Ethiopian Roads Authority (ERA) due to geography, pattern of settlement and economic activity [1]. This is because it provides the means for the movement of people, utilization of land and natural resources, improved agricultural production and marketing, access to social services, and opportunities for sustainable growth [1].

Historically, the existence of ‘roads’ or tracks in Ethiopia were simply the result of constant flows of passengers, animals or erosion rather than of planned and intended construction activities before 1950’s according to many researchers [2]. On the other hand, the literature entitled "History of Road Building in Ethiopia in Brief" states that under the rule of Emperor Menillik II road from Asmara to Addis Ababa and Addis Ababa to Addis Alem was built in 1903 [3]. It was this time that the first asphalt road appeared in Addis Ababa. While regimes and policies have changed, roads have remained important throughout the history of modern Ethiopia, and the road network has continuously grown, outliving its creators [2].

As per ERA report dated January, 2013, the Government of Ethiopia had formulated the Road Sector Development Program (RSDP) in 1997 by recognizing the importance of the road transport in supporting social and economic growth and its role as a catalyst to meet poverty reduction targets, which shows the increased emphasis on improvement of the quality and size of road infrastructure in the country [1]. This road sector

development program was formulated to address constraints in the road sector, mainly low road coverage and poor condition of the road network [1].

Accordingly, through 19 years starting from RSDP I in 1997 to RSDP IV until 2016, a total of 128,470 km of road physical works have been carried out by Ethiopian Roads Authority (ERA), Regional Roads Authorities (RRAs), Woreda Road Offices (WRO), community and municipalities with the total expenditure of 266.209 billion ETB [4]. After implementation of RSDP over 19 years, achievement in improving the size and quality of road network is remarkable according to ERA [4]. The road network of the country increased from 26,550 km in 1997 to 128,470 km in 2016. As a result, the road density per 1000 sq. km has increased from 24.1 km in 1997 to 102.8 km in 2016 [4]. Also, substantial improvement has been registered in the condition of the country's road network. The proportion of road network in good condition increased from 22% in 1997 to 72% in 2016 [4].

To this day, rural roads have been a major policy issue with significant consequences for the country and its population [2]. ERA in its report of 19 years RSDP performance released on October, 2016 revealed that, out of rehabilitation, upgrading, construction and heavy maintenance of 128,470 km of roads from 1997 to 2016, 68,035 km is construction of Woreda Universal Rural Road Access Program (URRAP) roads which is about 53% of the total achievement with the expense of about 4 billion ETB [4]. This is because, about 83% of the population lives in rural areas being engaged in agriculture, which employs 80% of labor force [5]. That is why rural roads have been a major policy issue with significant consequences for the Ethiopia and its population [2].

To learn from experience and to assure transparency in resource utilization, it is necessary to assess the performance of URRAP. But, besides yearly report of ERA and Transport Authority of the region, the recent performance of URRAP road has not been

studied in depth at Wolaita Zone. Therefore, it is necessary to assess the performance and associated factors of URRAP and reveal its' success/failure that enables to take future appropriate action. Factors that have influence on the performance should also be identified, so that the respective stakeholders need to work towards them.

## **1.2 Statement of the problem**

Ethiopia has implementing Universal Rural Road Access Program (URRAP) with its vision: to free the country's rural population from its' access constraints, reduce rural poverty, improve welfare and opportunity, stimulate agro-productivity and share growth - a growth in which poor people benefit from, by connecting all Kebeles by all-weather roads. The program has been launched since 2010/11 under RSDP IV by cooperation of Ethiopian Roads Authority, ERA and regional governments of Ethiopia to execute 71,523 km of all-weather roads with an estimated cost of more than ETB 26.4 billion which has been designed to be fully financed by the Government of Ethiopia [2, 4]. The plan was to connect 15,602 kebeles with Woreda and 11,876 kebeles together, which was supposed to ensure year round access to road for about 80% of the total rural population [4]. Creating 1.4 million job in addition to 275 local consultants and 945 local contractors throughout the country was part of 2010/11 up to 2014/15 plan [1].

By initiating large number of projects at the same time in rural areas of different Zones of the Southern Nations Nationalities and Peoples Regional State including Wolaita Zone by allocating huge capital for rural road construction, URRAP was new for the region as well as the country. The plan of 2010/11 to 2014/15 of SNNPR is about 14,003 km URRAP road [1]. It was planned to be executed by 51 consulting firms and 151 contractors according to ERA [1].

Since, limited resource of a country has been invested in the program, its' performance needs to be assessed for any future amendment. There was a yearly report that has been released only from the client, ERA. But international evaluation principles and standards of projects states that performance assessment report needs to be objective, participate all concerned parties in the entire process, transparent and focused, reliable, assessed by independent evaluators, complete and clear according to Austrian Development Agency (ADA) [6]. From the above international project evaluation principles and standards independence of evaluators is one which considers the credibility of evaluators through their independence from all staff involved in operation. Thus, it is not possible to learn from experience, to assure transparency in resource utilization, to examine the relevance of the project and to figure out tasks done to ensure the sustainability of the program without objectively and impartially planned scientific assessment.

That is why assessing the actual performance of the program and associated factors and how it looks like become the core assignment to be studied by this research work. More briefly the study focuses on assessment of performance of rural road construction being undertaken by URRAP in Wolaita Zone for its compliance with the plan, its' relevance from the beginning, its' sustainability and factors that are associated with its' performance.

### **1.3 Research objectives**

#### **1.3.1 General objectives**

The general objective of this research is to assess the performance of rural road constructed from February, 2012 to June, 2020 under Universal Rural Road Access Program, URRAP in SNNPR, Wolaita Zone. Critical success factors affecting the

performance of projects are also assessed, so that, respective stakeholders will take them into consideration for future performance improvement.

### **1.3.2 Specific objectives**

To assess the Performance of Rural Road Construction Undertaken by Universal Rural Road Access Program, URRAP in Wolaita Zone this research is anticipated:

1. To assess the performance of rural road constructed from February, 2012 to June, 2020 under Universal Rural Road Access Program (URRAP) in Wolaita Zone
2. To identify critical success factors affecting the performance of rural road constructed from February, 2012 to June, 2020 under Universal Rural Road Access Program (URRAP) in Wolaita Zone
3. To recommend necessary actions for future performance improvement of Universal Rural Road Access Program (URRAP) in Wolaita Zone based on the findings of assessment

## **1.4 Research questions**

The research work is expected to answer the following questions while attaining its' objectives. They are;

- How is the performance of rural road constructed from February, 2012 to June, 2020 under URRAP in Wolaita Zone?
- What are the critical success factors affecting the performance, so that they should be taken into consideration for better performance of rural road constructed under URRAP in Wolaita Zone?

- How many critical success factors are belonging to Client, Consultant, Contractor, project and external environment?

### **1.5 Significance of the study**

As limited capital has been invested on URRAP projects in Wolaita Zone, their performance evaluation is significant to learn from experience, to ensure transparency and deepening understanding among stakeholders. Besides, this assessment is crucial for application on rural road construction under URRAP in Wolaita Zone as stated below.

- It shows the effectiveness and efficiency of the projects based on which future actions will be taken. In depth assessment has been made to compare actual accomplishment with the plan which shows accomplishment.
- It shows the performance of the projects starting from relevance through effectiveness and efficiency to sustainability. Investment on projects based on sufficient study for their relevance is mandatory for wise use of limited resource. Works done to ensure sustainability of projects is also assessed.
- It provides the most up-to-date information of performance for policy makers to lean up on it for future appraisal and/or amendment of the program.
- It adapts performance evaluation criteria unique to rural road construction under URRAP in Wolaita Zone based on which the stakeholders will be able to evaluate similar projects in appropriate and fruitful manner.
- It identifies and categorizes critical success factors that need to be carefully considered for implementation of similar projects for future.

## **CHAPTER 2      LITERATURE REVIEW**

### **2.1 Introduction**

The purpose of this chapter is to provide detailed literature review about performance assessment of road construction projects, identification of performance evaluation criteria and critical success factors. Books, thesis, relevant website and lecture notes are reviewed to carry out this chapter.

### **2.2 Road transport over other modes of transport**

Among the modes of transportation that played a big role in the history of human being, road and water transport figure prominent according to Temsgen et al [7] . As per the Ministry of road transport and highways of the government of India, transportation by road has the advantage over other means of transport because of its easy accessibility, flexibility of operations, door-to-door service and reliability [8].

Although the expansion of the transport sector is of tremendous economic, social and political benefit, there are nevertheless some negative aspects as increasing in energy consumption, environmental pollution, traffic accidents, a source of anxiety in terms of congestion constitute the negative side of road transport sector [7].

### **2.3 Performance and associated factors of rural road construction in some selected countries**

The availability of rural roads in good condition reveals huge savings associated with reduced travel time, safety of passengers, good and timely delivery of local produce, and help the smooth transfer of policies from central governments to the communities in rural areas [9]. In Africa, especially in Sub Saharan African Countries the major challenges that rural roads face are lack of funding and a lack of engineering input during both

construction and maintenance activities [9]. Due to those reasons, rural roads are generally in poor condition and become nearly impassable during the rainy season due to erosion which is severely damaging them which has severe consequences on the economical transport of goods and services, and on the overall mobility of people, which hinders the country's development [9]. The combined effect of those performance shortcomings stated above have resulted in only about 34% of the population have access to rural road within 2km distance in Sub Saharan African (SSA) countries, compared to 90% in Asia and the Pacific, 65% in other developing countries, and 37% of world's population [9]. India is selected for its' economic growth, whereas, Botswana, Ghana and Kenya are selected due to the geographical location as they both are sub Saharan African countries just like Ethiopia for the discussion of rural road construction and its' performance.

### **2.3.1 Performance and associated factors of rural road construction in India**

Until 2011, more than 2.1 million km of rural roads had been constructed in India and were deteriorated faster than expected due the movement of heavily loaded vehicles on them [10]. This might show that there was poor estimation of axle load which is part of design, or poor management of roads. But if it was possible to allocate US \$ 1.7 billion a year to do works necessary to ensure sustainability, then it was possible to save US \$ 46 billion assets [10].

Some years later, Indian national roads development agency stated that the performance of rural road construction showed successful improvement in effectiveness of management such as establishing capable client organizations, streamlined procurement procedures, standardized technical designs, sound monitoring and quality assurance procedures and a regular and adequate flow of funds from central authorities down to

project implementation levels [11]. They stated that, there are a series of lessons learnt and practices serving as good examples on how to organize largescale infrastructure program which has resulted in successful implementation of rural road construction under Pradhan Mantri Gram Sadak Yojana (PMGSY), which is similar to URRAP in Ethiopia, and other programs [11].

Due to improvement in issues which were critical for success of the projects, the rural road network had experienced a considerable growth in terms of its total length, a significant improvement of the quality, very poor shape had been upgraded to all-weather standards with proper pavements, drainage and river crossings [12]. Though these findings show that the improvement in execution of PMGSY under Prime Minister's Village Road Program of India by constructing all-weather roads to nearly 200,000 villages at a cost of almost \$40 billion until 2015, the impact of the program on village economies was smaller than those anticipated according to Asher and Novosad [12].

### **2.3.2 Performance and associated factors of rural road construction in Botswana**

The construction of rural road has achieved its main objective which was to integrate the rural population in remote areas into the main economic and social network of the country by providing reliable all-weather road links between the rural areas and the major activity centers in Botswana [13]. But changes were made to the original rural road standard during the implementation of the project which include realignment of some sections of the roads, sealing of shoulders, and widening of the carriageways [14]. Though the changes were justified, they are however, a reflection of the fact that the roads were not fully surveyed and/or designed at the time of project appraisal as per the

justification of the report of the Bank. In general, the Bank concludes its' assessment as, projects as a whole was successfully implemented and the outcomes were sustainably being continuous despite the difficulties encountered during the construction works, and the final outcome is achieved due to the satisfactory performance of all concerned parties [14]. However, Khan, by referring different literature states that management of rural roads is almost neglected in Africa and in South African Development Community (SADC) countries including Botswana, as high priority has been given to the major roads [15]. Some of these countries do not have a techno-economic model or even an established Pavement Management System (PMS). Rather they manage assets in traditional approach, namely, by engineering judgement which is a simple method of recommending a treatment from one's experiences through visual inspection of roads, and political and social factors [15]. In other word, there is no scientific approach to suggest the right treatment at the right time and right place to ensure the sustainability of rural roads in Botswana [15].

### **2.3.3 Performance and associated factors of rural road construction in Ghana**

In the research done in Volta region of Ghana, factors critical to success of rural construction projects were identified by using Relative Importance Index (RII) calculated by using the response of study population by 5 point Likert Scale [16]. The Critical Success Factors (CSFs) identified were lack of financial institution with RII of 0.91, lack of potable water with RII 0.85, lack of good healthcare system with RII 0.84 and lack of good market with RII 0.81 and many other success factors with moderate influence on the performance of projects [16]. All factors were considered to impact severely upon rural development and hamper social-economic progress in the region. Though factors critical to success of rural construction projects had been properly identified and despite

successive governmental initiatives of the government of Ghana, efforts of the research had thus failed to address urgent societal need; most likely due to a toxic combination of alleged incompetence and corruption [16].

### **2.3.4 Performance and associated factors of rural road construction in Kenya**

James Kiragu on their research conducted in Kenya in 2017 stated that, rural road construction projects delay in time, there is cost overrun, time overrun, litigation and sometimes abandonment of projects despite billions of dollars' investment [17]. Management skills, resource availability, technological advancement and bureaucracy are factors that critically affect the completion of rural road construction projects called KeRRA in Kenya [17]. There is a significant relationship between project team training diversity and performance of rural roads construction projects in Kenya [18]. In other word, diversity of profession in manpower who is participating in the management of the construction of rural road is directly proportional to the performance of the projects.

## **2.4 Rural Road Construction in Ethiopia**

Road is one part of transport and communication sector out of three major sectors under construction industry. But road network coverage was limited to major urban areas and some rural areas in the late 1990s' in Ethiopia [4]. By the time, most areas in the country were isolated from economic centers, market and basic social services [4]. Moreover that, the existing road network was largely deteriorated and in poor condition as per 19 years' assessment report dated October, 2016 of RSDP of ERA [4].

On the other hand, the article entitled "History of Road Building in Ethiopia in Brief", stated that modern road construction has been started in Ethiopia in 1903 under the rule of Emperor Menilik II [3]. It was connecting Asmara to Addis Ababa and Addis Ababa to Addis Alem [3]. It was this time that the first asphalt road appeared in Addis Ababa.

Whereas, Temsgen et.al. in their report released in 2006 stated that public transport, especially taxi and bus services, started in Ethiopia during the Italian invasion [7]. Since then the investment in road sector has been increasing from time to time through different regimes.

Naod and Bamilaku on their study by quoting ERA stated that, road transport in Ethiopia is the dominant form of transport for well above 90% of motorized inter-urban-rural freight and passenger movements [5]. On the other hand, Ethiopian Economic Association on its' report of 2007 on Ethiopian Economy revealed that, about 95% of total value added in freight transport is attributed to road transport, 3% to pack-animals and the remaining 2% to rail transport [19]. This is because, Ethiopia is landlocked and that there are only few navigable rivers that can serve both domestic and international water transport services [5]. Additionally, Temsgen in his study which was conducted in 2006 revealed that 90% of freight transportation both in the import and export sectors and 95% of the public transportation services are provided by the road transport branch [7].

Moreover, about 83% of the population lives in rural areas being engaged in agriculture, which employees 80% of labor force, the role of rural road transport advancement plays the major role in improving rural livelihoods and agricultural growth as per Mekonnen and Bamilaku [5]. That is why rural roads have been a major policy issue with significant consequences for the country and its population [2].

#### **2.4.1 Universal Rural Road Access Program, URRAP in Ethiopia**

Program is defined as a collection of projects that are managed in some way to produce a more efficient outcome. The program manager is far more responsible than project

manager as he/she co-ordinates the outcome of groups of projects as per the guideline entitled as “Project and contract management guideline” [20].

On the other hand project is defined as a temporary endeavor undertaken to create a unique product, service or result [20]. Project is defined in more descriptive way as ‘a unique set of coordinated activities, with definite starting and finishing points, undertaken by an individual or team to meet specific objectives within defined time, cost and performance parameters. Project is temporary, since it has defined beginning and end in time, and defined scope and resource requirement. Project is unique, since it is not a routine operation, but a specific set of operations designed to accomplish an outstanding goal according to the guide line developed [20].

The government of Ethiopia has focused on road, especially, rural road under URRAP as part of its plan. According to the article of ERA, the reason for the continued pervasiveness of poverty is generally associated with low productivity of subsistence crop and a rain fall dependent cultivation which is vulnerable to the vagaries of weather [21]. This is because the driving sector for economy of Ethiopia is agriculture. Moreover, continued poverty prevalence is aggravated by the country’s rugged terrain, uneven geographic distribution of population and the predominance of isolated rural settlements with poor spatial integration according to ERA. ERA on its’ article entitled “universal rural road access program” about the importance of rural transport and services further describes that, isolation and unreliable or non-existent access to markets stifles economic activity and further adds burden to the rural poverty [21].

That is why, Abebe Dinku on the presentation in 2016 stated that about 70% of Ethiopia's capital budget was spent on infrastructure development for ten years back from 2016. Gradually this capital expenditure accounted for a large share of the budget is decreased from 51% in 2015/16 to 46% in 2016/17 according to African economic

outlook of 2018 [13]. Among this capital budget of federal government about 18.95% has been spent on the road sector [13].

Thus, the implementation of URRAP is aiming to accelerate the growth of rural areas in the country. As agricultural products cover major share in export, the increase in its productivity has direct impact on GDP of a country, meanwhile increases deposit of foreign currency.

Accordingly, 53 projects are completed and handed over to the client from Feb, 2012 to June 2020 in Wolaita Zone. They are listed in table 1. As it can be seen from the table the longest road is 18.30 km called Bombe – Ose Molle and shortest road is 2.25 km called Woyo Megenteya – Tida.

Table 1 – Lists of completed URRAP Projects in Wolaita Zone

S. No.	Project Name	Length (Km)
1	Gesuba - Lasho	14.50
2	Lera - Buge	10.14
3	Gilo Bisare – Otona Asphalt	12.00
4	Waraza Shoho – Bekilo Segno	9.72
5	Gocho - Wamura	7.03
6	Bossa Borto - Zerada	9.20
7	Gututo – Bolla Wanche	9.90
8	Bele - Hanaze	11.00
9	Wari Bira Golo – Galcha Loke	7.72
10	Wari Bira Golo - Olola	8.32
11	Bele - Gale	8.68
12	Gununo – Koisha Nare	15.00
13	Abaya – Abela Faracho 1	14.00
14	Abaya – Abela Faracho 2	15.00
15	Gununo – Gurumo Ladissa	10.32
16	Gununo – Sore Wamura	9.78
17	Bele - Gale	7.03
18	Okoto Sere - Garbe	10.54
19	Gesuba - Yakima	8.03
20	Woyo Megenteya - Tida	2.25
21	Galda - Michole	6.26
22	Ajora – Bombe	5.00
23	Irsha Mirmir - Weibo	5.92
24	Dola – Hajo Salata	9.98
25	Gacheno – Mokonissa Weige	11.60
26	Karchache - Workicha	13.80

S. No.	Project Name	Length (Km)
27	Dendo – Koisha Oda	10.00
28	Lera – Galcha Suke	11.30
29	Shanto – Galcha Suke	5.26
30	Dendo Ofa - Holeta	8.10
31	Karchache Ketema - Galcha	2.80
32	Bombe - Ose Molle	18.30
33	Bele – Oydu Chama	15.50
34	Shanto - Gacheno	8.24
35	Tebela Anka - Wanche	9.20
36	Buge – Wanche Sodo	10.62
37	Girara Matoria - Chifisa	9.40
38	Mundeja - Galcha	6.30
39	Waraza Shoho – Beklo Segno	5.57
40	Gofa Menged – Mante Gerera	4.18
41	Ansome - Ganbela	10.24
42	Denba Hereje – Ose Bombe	6.60
43	Girara - Oloba	3.60
44	Girara - Motala	2.80
45	K/Betek - Motala	8.60
46	Bitana - Ankarobe	12.00
47	Woshi Wocha Dekeya - Beklo	4.72
48	Areka - Legama	5.10
49	Irsha Mirmir – Afama 1	6.40
50	Irsha Mirmir – Afama 2	4.31
51	Irsha Mirmir – Afama Gale	7.66
52	Arfita - Areka	11.70
53	Irsha Mirmir - Korke	6.73
	Total	467.95

#### ***2.4.1.1 Objectives of Universal Rural Road Access Program, URRAP in Ethiopia***

The government of Ethiopia has thought that investment in transport, especially in rural road transport improves the well-being of the poor by:

- enhancing the quality and coverage of universal education by improving the recruitment and retain of qualified teachers and assistants;
- enhancing access of the poor to markets, jobs, schools, social and health facilities and financial resources so that their living standard and welfare has raised;
- providing opportunities for the poor to participate fully in development opportunities;

- providing both short term road building and long-term road maintenance employment opportunities [21]

To accomplish the objectives listed above, the Government of Ethiopia had planned to connect 43% of all Kebeles in entire country which are inaccessible by motorized transport in any season which ranges from 6% to 65% between regions in its' Growth and Transformation Plan II (2010-2015) which is underpinned by the road sector development program (RSDP-IV) starting from 2010/11 [21].

According to ERA, URRAP is not prescriptive in its approach, even though pilot projects had been implemented in selected eight Woredas ahead of launching. This is because it complies with local needs, local potential and local realities and considers experiences and lessons learned from a number of key pilot programs and projects implemented over 2005/06 to 2009/10 [21]. URRAP promotes application of innovation, knowledge and learning by taking in to consideration of local context, local needs, local capabilities and local realities [21].

URRAP follows labor-based approach, incorporation of community contribution and an expanded participation by the private sector which are stated as key elements [21]. Approach of the program during planning is to preserve assets through streamlining of sustainable maintenance and management systems through "length-man" approach.

The outcome that had been expected from URRAP after its' first phase implementation in entire country which has been taken place from 2010/11 to 2014/15 were [21]:

- rehabilitation and/or construction of 71,523 km of all-weather access roads to a maintainable condition,
- introduction of sustainable road maintenance system on improved road networks,
- developing and strengthening small and medium scale private enterprises working in support of the sector,

- creating massive employment opportunities for community and middle-level professionals, and
- instituting and strengthening an appropriate and affordable institutional set-up at Woreda level that can administer and manage roads under its jurisdiction.

#### *2.4.1.2 Implementation of URRAP in Ethiopia by small scale firms and its' performance*

The implementation of URRAP has been started in its' full potential by joining experienced local Engineers and surveyors together. These organizations are small scale and permitted only to engage themselves in construction and consulting of rural roads constructed under URRAP.

Paul Larcher in his study entitled "A Model for a Contractor Support Agency" conducted in UK stated that small scale local contractors are generally seen as holding the greatest potential for increasing construction capacity and general economic development as they [22]:

- have usually lower overheads which make them more competitive than larger firms on small or disparate projects.
- use less capital investment per unit of output than larger companies, they provide greater employment opportunities.
- have low entry restraint in terms of skills and capital requirements.
- minimize the flow of financial resources out of the country just like large local contractors.
- can contribute for the growth of the industry as some they will expand their businesses to eventually become large contractors.

The advantages of engaging small scale contractors to construction industry are not only true in UK but in Ethiopia too. That is why the government of Ethiopia had formed enterprises, parts of which are contractors and the remaining are consultants. The members of each enterprise had experiences in different construction sectors before they came together for this commitment. Some of them had been working for internationally competent domestic and international organizations with relatively high scale of salaries. They left these benefits by hoping that they would be able to establish their own company and grow it to competent as the government was promising so.

## **2.5 Performance Evaluation of Construction Projects**

Oxford learner's dictionary defines performance as, how well or badly you do something, how well or badly something works [23]. The study entitled 'analysis of effectiveness measures of Construction Project Success in Malaysia' defined performance as synonymous with success which is the degree of achievement of objectives [23]. Performance measurement is used to know how things are going so that we can have early warning of problems that might get in the way of achieving project objectives and so that we can manage objectives [24]. More briefly performance is defined as, the ability to achieve or enhance the creation of an outcome [23].

In general, performance evaluation of projects reveals the outcomes of the work whether they are intended or not with regard to some standard. For example, customer satisfaction seen as a measure of the organization potential for future sales that can be obtained by comparing a result internally or externally with some reference standard [25].

Then, project is assumed to be failed if its' completion time exceeded due date, expenses overrun the budget, or outcomes did not satisfy predetermined performance criteria [26].

Sometimes in contrast, though preset objectives did not met, projects are considered to be successful [26]. This is due to the difference in perception between parties participated in a project. For example, a project which is successful in the eyes of project team might be unsuccessful in clients' perception [26]. That is why conclusion of success and failure for a single project will sometimes be ambiguous according to Belassi and Tukel [26]. Because both of the parties are evaluating project success differently, and thus, they value the outcome differently.

World Bank in its' guidelines named "Guidelines for Reviewing World Bank Implementation Completion and Results Reports; A Manual for Evaluators" which was updated in 2014 uses relevance, efficacy and efficiency to measure performance of projects [27]. Relevance is divided as relevance of objectives and relevance of design when used as criteria [27].

It defines relevance of objectives as "the extent to which an operation's objectives are consistent with the country's current development priorities and with current Bank country and sectoral assistance strategies and corporate goals" [27]. Relevance of design is defined as "the extent to which the project's design (its planned activities or policy areas) is consistent with the stated objectives, including an assessment of the Results Framework" [27]. World Bank uses six ratings as highly satisfactory, satisfactory, moderately satisfactory, moderately unsatisfactory, unsatisfactory and highly unsatisfactory based on the extent of shortcomings in achievement of its' objectives [27]. On the other hand Asian Development Bank, ADB, assess the performance of own financed projects based on four category evaluation criteria of relevance, effectiveness, efficiency and sustainability [28].

### **2.5.1 Construction Project Success Criteria and Success Factors**

According to Oxford Advanced Learner's Dictionary, criterion means "a standard or principle by which something is judged, or with the help of which a decision is made"; whereas a factor is "one or several things that cause or influence something". So far, there is no accepted universal definition of project success according to Thu Anh Nguyen and Visuth Chovichien [29]. Definition of project success may vary depending on each industry, project team, or individuals' point of views [29].

Project is measured by either the product worked or did not around 1960s' [30]. Around 1980s' it was started to be evaluated in terms of meeting three constraints: time, cost and quality. The quality of a project was commonly defined as meeting technical specifications [30].

According to Khosravi, after the introduction of total quality management (TQM) in the late 1980s, the overall project success was started to be evaluated not only in terms of cost, quality and time, which are internal measures but also by including acceptance by the customer; and resulted in customers allowing the contractor to use them as a reference [30]. Thus, this model takes into consideration of the entire project life cycle and even beyond.

A major problem found with the recent methods of project performance measurement is the lack of consensus on what constitutes success or failure of the project [31]. Shahrazad and Hamidreza in their study stated that there is still a disagreement between researchers on project management as to what constitute project success and how it is to be measured. This is because according to the study of De Wit and Pinto, which later was reviewed by them, it is still difficult to measure project success since project stakeholders perceive success or failure factors differently [30]. Thu Anh Nguyen and Visuth Chovichien strengthen the idea by stating, project success is different among

participants, scope of services, project size and time (Shenhar and Levy 1997).

Sometimes it may vary among persons and within one phase of project [32].

Designers and contractors who are involved in the same project will have different project objectives [32]. Architects may call a successful project as long as the building has aesthetically beautiful view or functionality as main criteria, whereas, the owners criteria for a building may be cost effective than aesthetical, an engineer in terms of technical competence, an accountant in terms of dollars spent under budget, a human resources manager in terms of employee satisfaction, and a chief executive officers rate their success in the stock market [29, 32]. Also the definition of project success may change according to type, size and sophistication, project participants and experience of owners and etc. as per Albert and Chan [32]. That is why Lim and Mohamed on their study which was reviewed by Khosravi, stated that project success should be viewed from different perspectives of the individual owner, developer, contractor, user, and the general public and so on [30].

The study entitled “Project success is meaningful only if considered from two points” stated project success as the degree to which the project’s technical performance objective was attained on time and within budget and the contribution that the project made to the strategic mission of the enterprise” [29]. According to this definition, project has to be evaluated for its’ relevance before commencement. In addition to fulfillment of technical performance objectives, if a project is assessed in advance for the alignment and complement with the strategic mission of the enterprise and if its’ result is ok, then it will be ended up with success.

Though these different ideas are rising on the concept of success of construction projects, there is one definition in more general way according to Anh Nguyen and Visuth Chovichien [29]. This definition states that “the project is considered as an overall

successful if the project meets the technical specification and/or mission to be performed and if there is a high level of satisfaction concerning the project outcome among key people in the parent organization, key people in the project team and key users or clientele of the project effort". According to this concept, a project should satisfy the key people with in parties in addition to fulfillment of technical specification.

### ***2.5.1.1 Construction project success criteria***

Criterion can be defined as a standard of judgment or principle by which something is measured for value [29]. Sometimes the concept of project success criteria and project success factors are interchangeably used though they are different [29]. A set of criteria for project success establishes the foundation for project performance judgment [29].

On the other hand, success is defined as favorable outcome or the gaining of fame or prosperity [32]. Albert and Chan, defines project as the achievement of a specified objectives, which involves a series of activities and tasks that consume resources [32]. By combining these terms together Albert and Chan came up with the definition of project success criteria as the set of principles or standards by which favorable outcomes can be completed within limited time to a set of specification" [32]. But it is believed that project objectives are mainly the most appropriate criteria for project success. The success or failure of a project is determined based on the degree to which these objectives are being met [29].

During a ten-year period, from 1990 to 2000, more than twenty studies were conducted to establish project success criteria [29]. These project success criteria are separated into objective measures and subjective measures. Related to objective measures, four criteria occurred in most of studies are Time and cost, 'Budget/ Financial performance/ Profitability, Health and Safety, and Quality [29].

Satisfaction is subjective success measurement criterion and can be categorized as Satisfaction of Client/Customer, Contractor, and project management team in almost all studies [33]. On the other hand, Shahrzad divides success criteria into delivery and post-delivery stages and provides iron triangle to understand [30]. In delivery stage, the iron triangle has cost, time and quality and in post-delivery stage it comprises of information system, organizational benefit and stakeholder community benefit [30]. Sub criteria categorized under information system are maintainability, reliability, and validity and information quality. Under organizational benefit; improved efficiency, improved effectiveness, increased profit, strategic goals, organizational learning and reduced waste can be categorized as per Atkinson. Social and environmental impact, personal development, professional learning, contractors profits, capital suppliers, economic impact to surrounding community are some of sub criteria to be categorized under stakeholder community benefit [30].

#### ***2.5.1.2 Construction project success factors***

Project success factors are the set of several things that cause or influence project outcomes and are able to contribute to the project success or failure [26]. These factors can be grouped into different classes by different researchers. Walid on their study classified critical success factors of projects in to four as shown in figure 1 below [26].

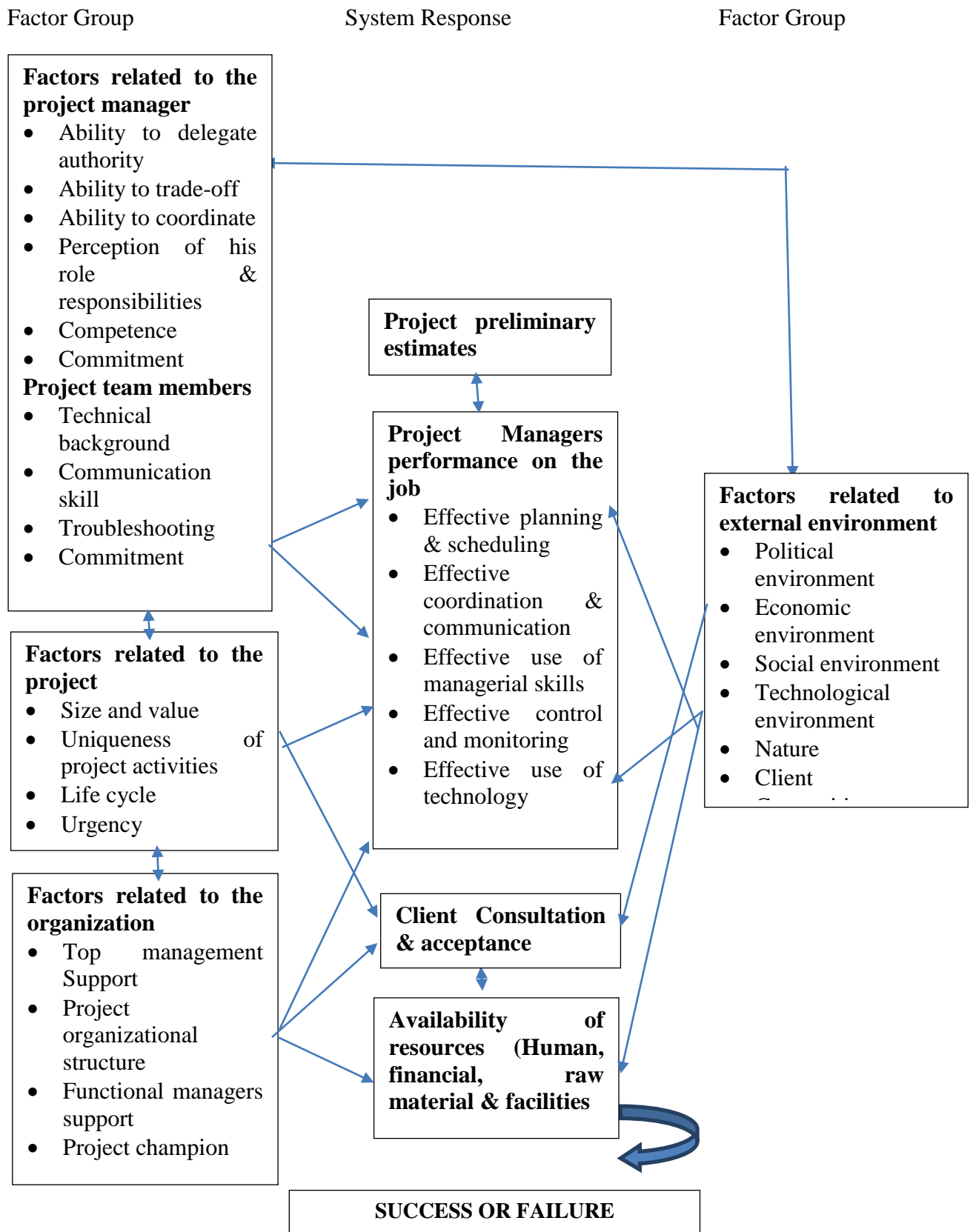


Figure 1 - Success factors and their grouping [26]

According to this study grouping critical success factors in stated ways has many advantages. Some of them are ease of identification whether the success or failure is related to either of the groups, helps to understand the intra-relationships amid the factors in different groups, ease of adaptation of factors to the specific situation and enables observing cause- effect relationship between factors and system response that has an ability to endanger the success of a project [26].

Success factors collected from literature, suggestion of experts and past experience to be evaluated for their criticality are shown in table 1.

Table 2 – Success factors collected from literature

S. No.	Success factors
1	Weather condition of area of project
2	Uniqueness of project activities
3	Top management support and commitment to the project
4	Timely delivery of design, specification and related documents
5	The time taken for scope change, design and specification approval
6	The time taken for decision making
7	The flexibility of the system to use innovative building materials
8	The density of project network
9	The degree of definition or clarification of scope/goals and objectives of project
10	The clarity of terms and conditions in contract
11	The adequacy of feasibility study
12	Terrain of the route of project
13	Technological advancement/level of new technology development
14	Technical capacity of contractor
15	Support from banking and finance sector
16	Sub-surface condition of the project area
17	Stability and efficiency of government policies, regulations, standards and legal systems to support the project
18	Social/cultural environment and community involvement/support
19	Size of project
20	Repeated change of design during construction
21	Rapid change in national economy/economic change
22	Quality control and ensuring implementation of effective quality assurance program
23	Project monitoring/progress meetings
24	Project life cycle and urgency of outputs

S. No.	Success factors
25	Profit margins in the program
26	Presence of appropriate organizational structure
27	Planning, monitoring, and controlling mechanism
28	Opportunities for research & development
29	Nature/ecological/Physical environment
30	Manpower/labor productivity
31	Location of project
32	Level of usage of IT, professional software and related technologies
33	Level of participation of enterprises in industrial oriented research & development
34	High inflation rate/fluctuation of material price
35	Government political support & political stability of the project area
36	Government policy on tax
37	Government involvement in research and development
38	Follow up and ensuring implementation of effective health and safety program
39	Financial capacity of client /Timely payments
40	Feedback mechanism from employer and other parties
41	Establishing an effective document control system
42	Effectiveness of contract administration and supervision
43	Effectiveness of communication systems
44	Effective site management/control and coordination
45	Effective project team formation, commitment and motivation of the team
46	Effective project contract management system
47	Effective management of meeting and ensuring the implementation of issues as decided by all stakeholders
48	Ease of access and the distance traveled to equipment maintenance center/Garage
49	Ease of access and distance traveled to material testing laboratories
50	Design team's contribution to construction (constructability, review, value engineering, etc.)
51	Design errors/mistakes and discrepancies
52	Design and material change by clients
53	Decision-making effectiveness of contractor
54	Currently practicing government grading system of enterprises
55	Contractors experience
56	Consultant competence/skill/experience
57	Consultant commitment and cooperation in solving problems/quick decisions
58	Complexity of project
59	Communication among project stakeholders
60	Commitment of consultant to meet project objectives
61	Client characteristic (risk attitude, emphasis on low cost, quality, speed etc.)

S. No.	Success factors
62	Client's experience in construction field
63	Clear and detailed procurement process and strategy
64	Clarity of roles and responsibilities among departments, teams both horizontal and vertical
65	Change control, risk identification and management effectiveness of consultant
66	Capability of contractor to coordinate Subcontractor
67	Capabilities and innovativeness of consultant's staff
68	Building trust shared by project participants
69	Bribe/corruption and favoring habit in the project area
70	Availability of resources as planned throughout the project
71	Availability of liquid asset and/or cash flow management
72	Availability of human and other resources in the local market
73	Availability of experienced professionals and skillful work force/staff
74	Availability of experienced and skillful manager/team leader
75	Availability of advanced/new technologies/ construction equipment and materials
76	Availability and timely supply of utilities like electricity, water, etc.
77	Allocation of funds for research & development
78	Administration and bureaucracy in enhancing productivity
79	Adequate training's and skill development programs
80	Adequate technological knowledge and transfer
81	Adequate communication among all project participants
82	Adequate career development programs
83	Adequacy of plans and specifications
84	Adaptability of consultant to comply with changes in project plan
85	Ability to mediate between stakeholders during dispute
86	Ability of contractor for having detailed project planning/estimations and scheduling
87	Statutory approvals by the respective government bodies
88	Labor turn over
89	Incentives for better achievements to create competition among teams so that productivity will be enhanced
90	Implementing of an effective health and safety program
91	Effective quality assurance program
92	Effective project risk management system/process
93	Design simplicity
94	Allocation of manpower on the right activity in the right time

### ***2.5.1.3 Critical Success Factors (CSFs)***

Some success factors are called critical success factors (CSFs) and could critically affect the performance in either positive or negative direction [33]. The concept CSFs was introduced by Rockart in 1978 who highlights the importance for organizations to have control over them in order to be successful [33]. Freund defines the CSFs as “those things that must be done to make the company successful” [33]. Thus, CSFs are factors within the firms that help organizations to be favorable on a competitive market.

CSFs can be possessed by all organizations in a given market, and can rather be seen as a must for survival. Vasconcellos et al. (1989) study contributed with quantifiable support that organization with higher ratings on CSFs than competitors on the market possess strengths in the given areas and will outperform the competition [33]. This means when an organization is aiming for superiority over others, the manager should concentrate on few CSFs very well instead of a greater number of factors reasonably well (De Vasconcellos et al., 1989). Consequently, Boynton et al. (1984) argues that when an organization’s CSFs are identified they need careful attention, as it is vital for the organizations operating activities and its future prosperity (Boynton et al., 1984).

Murat had categorized 40 success factors into seven based on their characteristics and discussion with professionals in the construction management field [34]. The seven categories as per this research are Project related factors, Business and work environment related factors, Client related factors, Project management factors, Design team related factors, Contractor related factors and Project manager related factors [34].

Relative importance index is used to select critical success factors out of these 40 success factors [24]. Relative Importance Index, RII is shown as:  $RII (\%) = (\sum W / (5 * N)) * 100$  ( $0 \leq RII \leq 100$ ) (1) Where: W: the weight given to each attribute by the respondents between 1 and 5 N: the total number of participants

### **2.5.2 Construction projects performance measurement methods**

An article entitled “A Practical List of Criteria for Evaluating Construction Project Success in Developing Countries” discovered more than fifty-five success criteria [29]. These success criteria were collected from literature review, information from past projects and opinion of experts working in construction sector and are categorized under twelve broad classifications [29]. Capacity of success criteria to collect information, the level of importance and their applicability in developing countries are used as criteria to select and prioritize them. Accordingly, the study had come out with project success evaluation frame work having forty six sub criteria by eliminating nine sub criteria under twelve broad classifications [29]. Success measurement method needs to be crafted for performance measurement by considering both clients and contractors.

World Bank in its’ guidelines named “Guidelines for Reviewing World Bank Implementation Completion and Results Reports; A Manual for Evaluators” which was updated in 2014 uses relevance, efficacy and efficiency to measure performance of projects [27]. Relevance is divided as relevance of objectives and relevance of design when used as criteria [27].

It uses six ratings for project performance as highly satisfactory, satisfactory, moderately satisfactory, moderately unsatisfactory, unsatisfactory and highly unsatisfactory based on the extent of shortcomings in achievement of its’ objectives in its; efficiency or in its’ relevance as no, minor, moderate, significant, major and severe respectively [27] . This guideline rates the performance based on comments from the member of review panels which is composed of senior staffs and consultants [27].

On the other hand Asian Development Bank (ADB) guideline released in 2009, and Austrian Development Agency (ADA) releases in 2007 assess the performance of projects based on four category evaluation criteria of relevance, effectiveness, efficiency

and sustainability [28]. Each of criteria have sub criteria and those sub criteria are used to collect data to assess the performance of projects. The definition of criteria, their weighted average and their meaning with performance of a project can more briefly be seen from the following table as per ADB, and ADA [6, 35].

Table 3 - Criteria, their definition, their weight and sub criteria [6, 35]

<b>Criterion</b>	<b>Weight (%)</b>	<b>Definition of Criterion</b>	<b>Rating Description</b>	<b>Rating value</b>
Relevance	25	Relevance is about the consistency and compliance of the impact and outcome of a project with the governments long term development strategy and with Millennium Development Goal, MDG. In other word, it is about the extent of the work done to justify project intervention was satisfactory and was based on a sound analysis, including consideration of the main constraints to the achievement of results. Additionally it considers the extent to which the design and the financing instrument selected were an appropriate response to the identified problem [6, 35].	Highly relevant Relevant Less than relevant Irrelevant	3 2 1 0
Effectiveness	25	Effectiveness is about the extent of attainment of output/outcome by comparing it with the one specified during agreement or subsequently modified as per Austrian Development Agency, ADA [6]. In other word, it is a measure of the output or result or major relevant objectives an intervention has attained in efficiently in a sustainable fashion and with a positive institutional developmental impact [6, 35].	Highly effective Effective Less than effective Ineffective	3 2 1 0
Efficiency	25	Efficiency is a measure of how economical resources have been converted to results using the economic internal rate of return or cost-effectiveness of the investment or other indicators as a measure [35].	Highly efficient Efficient Less than efficient Inefficient	3 2 1 0
Sustainability	25	Sustainability is the likelihood of maintaining the outcome and impact for its economic life [6]. Or it is the probability of continuation of long-term benefits. It is about the continuation of benefits from a development intervention for a design life without excessive maintenance cost after major parts has been completed [6].	Most likely Likely Less than likely Unlikely	3 2 1 0

Table 4 - Weighted average score of criteria [35]

<b>Weighted average Score of Criteria</b>	<b>Performance of the project</b>	<b>Descriptions of performance of the project</b>
2.7 ≤ X ≤ 3	Highly Successful	The achievement of the project exceeds expectation; the output and outcome have high probability to be sustainable, efficient over the life of project, and the project remains with no significant unintended, effects.
1.6 ≤ X < 2.7	Successful	No major deficit has taken place. Expected output and outcome will entirely be achieved; the project remains relevant and sustainable over its' life and is efficient in its operations and implementation. But there are some negative results which are small in relation the gains of the project that prevent a rating of highly successful.
0.8 ≤ X < 1.6	Less than successful	The output and outcome of some component of the project is approximately half the level of original plan or expectation. There might be significant shortfall in achieving planned outcome and impact and the project may unlikely be sustainable.
< 0.8	Unsuccessful	Negative effects in the outcome and impact may be apparent and to be operated at a low level of installed capacity or at high cost and demands large subsidy. In other word, the project is technically (minimal achievement of outcome) and/or economically failed.

## 2.6 Gap identification and Summary

Rural road network has impact on livelihood of rural population. Countries were working to improve the network and performance of rural road by overcoming shortcomings happening during implementation. Performance shortcomings have resulted in only about 34% of the population to live in areas with access to rural road within 2Km distance in Sub Saharan African (SSA) countries, which is far below than other parts of the World [9].

Ethiopia has started Universal Rural Road Access Program (URRAP) in entire country including SNNPR starting from 2011/2012. Wolaita Zone is one of Zones in SNNPRG with around 468 km of URRAP road were built until June, 2020 which is about 7.58% of the achievement of SNNPR. But, except expression of road in length there is no in-depth assessment conducted in Wolaita Zone to know the performance of URRAP in the Zone. There are many researches done so far related with performance of construction of rural roads. These researches use many performance measuring criteria which are categorized indifferent ways. Most of these criteria are used to measure the performance of construction phase. They give few concentrations on the relevance of the project before construction starts and its sustainability after commissioning of the finished work. Rather, most of them focus on evaluating projects with regard to the fulfillment of objectives stated in construction contract which neglect relevance and sustainability and focuses on effectiveness and related evaluation parameters.

Assessing performance with regard to relevance and sustainability in addition to effectiveness and efficiency is necessary to ensure appropriate utilization of limited resources. Asian Development Bank (ADB) uses these four criteria to evaluate performance, and due to this it is selected for this thesis work. Accordingly, projects are

evaluated for their performance starting from their relevance before construction begins. Relevance is about the consistency and compliance of the impact and outcome of a project with the governments long term development strategy [35]. Projects are evaluated towards their relevance and prioritized accordingly, so that limited resources are invested on the right project.

Another merit of ADB method of construction project performance assessment is that its' consideration of sustainability as one criterion. Sustainability is about the likelihood of maintaining the outcome and impact for its economic life, Or it is the probability of continuation of long-term benefits [35]. It considers about the ability of projects to serve for their design life without excessive maintenance cost. Therefore, it is not questionable to use sustainability and works done to ensure sustainability as a criterion to evaluate performance of construction projects.

Due to the above merits, ADB method of assessing performance of construction projects is selected for this research work. The method is recognized and adapted by Austrian Development Cooperation due to its international acceptance [6].

In addition to assessing performance, identifying and categorizing critical success factor is one of objectives of this research work. Success factors are defined as factors that have influence in either positively or negatively on the performance of a project. They are categorized in different ways in different literature. Some of these factors are critical as they have critical effect. These success factors are not identified yet for URRAP in Wolaita Zone. Therefore, 94 success factors are collected from literature, past experience and suggestion of experts, to identify critical success factors (CSFs) among them.

## **CHAPTER 3 RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter describes the methodology followed to study performance of rural roads constructed under Universal Rural Road Access Program (URRAP) in Wolaita Zone. Study area, research design, population size, sampling and data collection and analysis methods are discussed. It enables to achieve the ultimate goal of the research which is solving the problem stated in this research work.

### **3.2 Study area and study period**

Wolaita is a zone in Southern Nations, Nationalities and Peoples Regional State (SNNPRS) of Ethiopia. The capital is Sodo and is located 325 km south of Addis Ababa and about 167 km south west from the capital of the region, Hawasa. According to the 2007 census conducted by Central Statistics Agency (CSA) the zone has a total population of 2,473,190 while some researches make it about 1,700,000. From the total population 11.49% are urban dwellers while 0.08% pastoralist and the remaining 88.43% is rural inhabitant whose life is attached to agriculture. It has a total area of 4,208.64 square kilometers. The zone has a population density of 356.67/km sq.

The zone is recently divided in to 22 Woredas though the administrative boundary of each Woreda is not demarcated yet. The former map of the Zone is shown in figure 2. The Zone has elevation from 1500 meters above mean sea level at Abela to the 3000 meters above mean sea level at mount Damot. Terrain of the Zone ranges from flat to mountainous. From SNNPR, Wolaita Zone is selected for this research, the Zone has better data access than others, it has diversified weather condition, terrain from flat to

mountainous and both subsistence and cash crops which has relation with rural road access. This research was conducted from March 2018 to September, 2020.



Figure 2 – Administrative map of Wolaita Zone

### 3.3 Study design

A descriptive study design was employed to assess performance and associated factors of rural road construction under URRAP in Wolaita zone constructed from February, 2012 to June, 2020.

### 3.4 Source population, study population, sampling and sample Size

The source population for this thesis work is rural road projects constructed under URRAP in Southern Nations Nationalities and Peoples Region whereas, study population is rural road projects constructed under URRAP in Wolaita Zone.

### **3.4.1 Sample size and sampling procedure**

All 22 Woredas have at least one project and the Zone has a total number of 53 projects with a total length of 468 kms which are completed to the serviceable level. In other word, as study population which is 53 in number is less than 100, there is no need of sampling and the entire population is considered for the research as per Gay and Airasan (2005) which is referred by Addisu Mosisa [36].

Therefore, based on the information above, the study population for the survey did not require sampling and the entire population was considered for the study. Study unit for this research were Contractors and Consultants working in URRAP in Wolaita Zone, representatives of client from ERA and Regional roads authority, senior engineers who are working for universities as lecturer and different consultants and contractors.

### **3.5 Data Collection**

Qualitative and quantitative data was collected to assess the performance and associated factors of rural road construction in Wolaita zone. Both primary and secondary data are collected for the research wok. Primary data is collected from study population by questionnaires which are designed. To collect quantitative data, three independent questionnaires were used. One is for adaptation of Asian Development Bank (ADB) projects performance assessment method for performance assessment of rural roads constructed under URRAP in Wolaita Zone. For this task a panel of experts with a total number of 23 was participated. Members of panel of experts are University lecturers and engineers who are working for private consultants and contractors, most of whom have experience in URRAP. Their background is described in section 3.5.1.1. (c).

The second questionnaire designed was to collect data for performance evaluation which has been used as an input for performance assessment. The third questionnaire was

designed to collect data about the importance of success factors based on the degree of influence on the performance of projects.

Contractors, consultants and others who have involvement in one or the other way on URRAP projects, Engineers from ERA, SNNPRG roads authority, Zone and Woreda road administration office are involved as study population. Each contractor has 4 members with a title of Civil Engineer (General Manager), Material Engineer, Superintendent and Surveyor with a total number of 48 members in 12 firms. Consultants have a total of 18 members in 6 firms with a title of Road Engineer, Material Engineer and Surveyor and both of them are participated in this study.

Most of the respondents have a minimum of bachelor degree and with masters of Science holders in between by Civil Engineering and related fields. They are owners of the firms and most of them were in URRAP road construction projects starting from the commencement of the first project in the Zone.

Secondary data about the progress of projects constructed from February 2012 to June 2020 is collected from SNNPR Transport Bureau. This progress data includes both physical performance and financial expenditure. To collect qualitative data regarding grouping of success factors under the respective stakeholders, focus group discussions were employed.

Six data collectors were involved in data collection process who were trained on the way collection of data using data collection tool. The principal investigator was continuously supervising the data collectors by phone call and in person. Questionnaires were distributed to the respondents by hard copy and also sent by email, telegram and related web based modalities. The table 3 below shows the breakdown of questionnaires.

Table 5 - Questionnaire distribution modalities

S. No.	Stakeholders respondents represent	Total questionnaire distributed	Delivered by personal hard copy	Sent by email, telegram and related web based communication
1	Client	23	18	5
2	Contractor	48	23	25
3	Consultant	18	12	6
4	Others (University lecturers, etc.)	13	12	1
	Total	102	65	37

The collected data was checked for completeness, consistency and clarity.

### 3.5.1 Data collection tool

#### 3.5.1.1 *Adapting projects performance assessment method*

Before conducting performance assessment of URRAP road at Wolaita Zone, success measurement method has been adapted. This is because, it is necessary to customize project performance evaluation tools to actual situation.

##### *a. Rationale behind selection of Asian Development (ADB) project performance assessment method*

It is obvious that contracting parties have different objectives when executing a single project. For example, contractor has prior objective of gaining profit and relevance of the project is not his forefront objective, which on the other hand, becomes one of core criteria for the client to evaluate the performance for efficient use of limited resource. Because, evaluating construction projects based only on requirements stated on construction contract might not be sufficient to know its entire performance.

From literature reviewed in chapter 2 of this research work, Asian Development Bank, ADB, method of performance measurement was selected for this research work. It is appropriate than other methods. One of its' advantage is its' ability to consider the

relevance and sustainability as criteria for evaluation of performance which consider the performance beyond construction phase.

Ensuring relevance needs to be one and main requirement to invest limited resource. Many public projects have been built without sufficient assessment of their relevance in Ethiopia. Construction of condominium houses started in many small towns can be typical example for the lack of assessment to ensure relevance. These projects are abandoned yet after finishing structural part. Therefore, relevance of projects need to be assessed before their commencement to ensure appropriate use of limited resource.

Another issue is about sustainability. Projects after commissioning should serve for their entire design life without excessive maintenance cost. Roads constructed by investing millions and billions of birr should serve for their entire design life without excessive maintenance cost. Dams constructed by investment of billions of birr should serve for their entire design life without occupying its' storage by unexpected silt. That is about sustainability of projects which needs to be ensured to say a project is successful.

In Ethiopia, except certain construction projects delivery systems like Build Own Operate Transfer (BOOT), most construction projects are delivered to contractors with liability of summation of contract time and defect liability period of 365 days as per standard conditions of contract of Public Procurement and Property Administration Agency (PPPAA) [37]. Accordingly, the contractor becomes no more liable for the project after handing over to the client at the end of defect liability period except for complete collapse, in which case, contractor will be liable for ten years from the date of commissioning according to article 3039 of Civil Code. That is why sustainability can mostly be not considered as a criterion to evaluate the performance of construction projects in the perspective of contractors.

Therefore, if performance evaluation of certain construction project is necessary and required to provide comprehensive result, then it is necessary to be evaluated with regard to relevance and sustainability in addition to other criteria like effectiveness and efficiency.

That is why performance evaluation method of Asian Development Bank (ADB) is adapted for performance assessment of rural road constructed under URRAP in Wolaita Zone as it uses relevance, effectiveness, efficiency and sustainability as criteria. There are many sub criteria under each criterion. These four criteria were allowed to be reviewed and modified by evaluators to particular situation [35]. As reference, the weight allocated by ADB for all four criteria was 0.25 in its 2013 version of the guideline. But two years back the bank had used 0.20 for each of relevance and sustainability, whereas, 0.3 for each of effectiveness and efficiency. This implies that it is possible to customize the weights of criteria for the respective situation.

***b. Adaptation of Asian Development (ADB) project performance assessment method***

To adapt assign weights for relevance, effectiveness, efficiency and sustainability, three-round Delphi questionnaire survey has been conducted. In the first round, four criteria and the respective sub criteria which has been collected from literature including guidelines of ADB were listed and three questions were posted.

Panel of experts with 23 members have been given lists of criteria and sub criteria, and in first question they were asked to assign weights for criteria. In the second question they were requested for any comments on sub criteria regarding the modification of any of them. In the third question the respondents were asked to propose any other new criteria which they believe that they are missed to the end of the list.

The weights for main criteria and the degree of agreement for sub criteria in the first round responses were aggregated and the averages were calculated and written in front of each criterion. Then, for the second round, panel of experts was requested to reassess by considering the response of others. Third round Delphi questionnaire is repeated just like the second round. Finally, the responses are aggregated and the average is taken as the respective weights of each criterion and sub criteria are refined.

Then, the responses of third round are aggregated and their mean is calculated by using IBM SPSS version 25. Accordingly, the result of the weight is shown in the following table.

Table 6 - The weight of criteria resulted from three round Delphi technique

S. No.	Criteria	Weights of Criteria				
		N	Minimum	Maximum	Weight (100%)	Std. Deviation
1	Relevance	20	20.00	40.00	29.50	5.35
2	Effectiveness	20	10.00	25.00	20.50	4.26
3	Efficiency	20	15.00	35.00	23.50	5.46
4	Sustainability	20	17.50	35.00	26.50	5.34
	Number of respondents	20				

*c. Panel of experts participated in three round Delphi questionnaire technique*

*1. Response rate of panel of experts*

Questionnaires were sent to 23 members of panel of experts by person and 20 of them were able to respond both three round questionnaires which is 87 percent response rate. Members of panel of experts are selected by purposive sampling based on their educational background, area of specialization, experience they have in URRAP and related criteria described from 2 to 7 in the following sections.

*2. Background of panel of experts*

Background of respondents includes educational background, the position (title) in the organization, profession (area of specialization), the total number of years of experience

they have in construction industry and the total number of years of experience they have in URRAP projects.

### **3. Educational background of respondents**

Educational background of respondents of panels of experts is shown in the following tables. Accordingly, 85 percent of respondents have MSC/MEng degree which make the respondents better candidates for the research as can be able to analyze the situation.

Table 7 - Educational background of respondents

S. No.	Educational Background of respondents	Number of respondents	Percentage of respondents against total
1	PhD	0	0
2	MSc/MEng	17	85
3	BSc	3	15
4	Diploma/Advanced Diploma	0	0
	Total	20	100

### **4. Position of members of panel of experts in organization they are working**

The positions of members of panel of experts are shown in the table 6 below. All of them have experience in URRAP. The position they were working when they participate in this study shown that 80% of them are Lecturers of universities, Technical Managers of Category – 1 contractor and Managers and Vice Managers of Private Consultants who have experience in URRAP. This shows that most of member of panel of experts have deep knowledge about the program.

Table 8 - Position of members of panel of experts

S. No	Position of respondents in the organization	Number of respondents	Percentage of respondents against total
1	Lecturers of universities, Technical Managers of Category – 1 contractor, Managers and Vice Managers of Private Consultants	16	80
2	Research and development unit head, Contract administration higher experts, Project Engineer in government organization	4	20
	Total	20	100

**5. Area of specialization of members of panel of experts**

The area specialization of members of panel of experts is shown in the table below. Hundred percent of members of panel of experts are Civil Engineers, Road and Transport Engineers and Construction Technology and Management professionals whom area of specialization make them the best candidate for the research.

Table 9 - Area of specialization of members of panel of experts

S. No.	Area of specialization	Number of respondents	Percentage of respondents to total number of responses
1	Road & Transport Engineering	9	45
2	Construction Technology and Management	4	20
3	Civil Engineering	7	35
	Total	20	100

**6. General experience of members of panel of experts in construction industry**

Table 7 below shows experiences of members of panels of experts with in the ranges of years stated in construction industry. As it can be seen from the table that 75 percent of members of panel of experts have more than 10 years of experience in construction industry which shows that they have sufficient knowledge about the behavior of construction industry of Ethiopia.

Table 10 - Experiences of members of panel of experts in construction industry

S. No.	Number of years of experience in construction industry	Number of respondents	Percentage of responses with regard to total number of respondents
1	$\leq 1$	0	0
2	$1 < X \leq 5$	0	0
3	$5 < X \leq 10$	5	25
4	$10 < X \leq 15$	14	70
5	$15 < X \leq 20$	1	5
6	$> 20$	0	0
	Total	20	100

**7. Experience of members of panel of experts in URRAP**

Table 8 below shows experiences of members of panels of experts in URRAP with in the ranges of years stated. As it can be seen that 90 percent of members of panel of experts have 5-10 years of experience in URRAP which shows that they have adequate knowledge about URRAP.

Table 11 - Experience of members of panel of experts in URRAP

S. No.	Number of years of experience in construction industry	Number of respondents	Percentage of responses with regard to total number of respondents
1	$\leq 1$	0	0
2	$1 < X \leq 5$	2	10
3	$5 < X \leq 10$	18	90
4	$10 < X \leq 15$	0	0
5	$15 < X \leq 20$	0	0
6	$> 20$	0	0
	Total	20	100

**d. Using adapted tool to assess performance of URRAP in Wolaita Zone**

Sub criteria collected and refined as per the suggestion of panel of experts and send to respondents are shown in the appendix 1. It is these sub criteria including main criteria under which each sub criteria are categorized is distributed to study unit. The respondents are requested to rate 3 if the performance of the project towards such sub criteria is highly relevant/highly effective/highly efficient/most likely, 2 if the performance of the project assessed towards such sub criteria is relevant/effective/efficient/likely, 1 if the performance of the project assessed towards such sub criteria is less than relevant/less than effective/less than efficient/less likely and 0 if the performance of the project assessed towards such sub criteria is irrelevant/ineffective/inefficient/ unlikely, of relevance, effectiveness, efficiency and sustainability respectively.

The responses are analyzed by using Statistical Package for Social Sciences (SPSS) and the mean are calculated. The mean of sub criteria under each criterion are multiplied by the respective weights of criteria shown on table 3. Then, the final result is interpreted according to table 2.

### **3.5.1.2 Grouping success factors and identifying critical success factors (CSFs)**

#### *a. Grouping of success factors*

To collect qualitative data regarding grouping of success factors under the respective stakeholders, focus group discussion was employed. A focus group discussion has five members who have background of civil engineering and related area of specialization, experiences in construction industry and three of them are lecturers in the universities. Ninety-four success factors which can affect performance of construction projects are collected from literature, from past experience and suggestion of experts.

Some of the success factors are ambiguous to be categorized under specific category as they seem to be grouped in other category too. For instance, effective project team formation, commitment and motivation of the team and Project monitoring and/or progress meeting are examples of ambiguous success factors to categorize.

Effective project team formation, commitment and motivation of the team are factor that can be related to both contractor, consultant and client. But this success factor has high effect on the performance of project when it can be managed by contractor than client or consultant as direct execution of the work is vested on contractor. Categorization of project monitoring and/or progress meeting is also ambiguous between client and consultant. The focus group has made deep discussion and finally agreed to categorize it under client. As per the suggestion of focus group, in Ethiopia, conducting project

monitoring and/or progress meeting is the responsibility of client even though consultant have small share of it.

Accordingly, from these ninety-four success factors, 12 success factors are categorized under client, 18 success factors are categorized under consultant (engineer), 32 success factors are categorized under contractor, 9 success factors are categorized under project and 23 success factors are categorized under factors related with external environment of the project. They are mainly grouped based on their relationship with the respective stakeholder and the way they can be managed.

***b. Identifying critical success factors (CSFs)***

Questionnaires that have these 94 success factors were distributed to respondents to rank based on their degree of influence on the performance of URRAP in Wolaita Zone. Respondents were asked to assign weight that ranges from 1 which has insignificant effect to 5 with very high effect to the performance of the project. In other word, the higher the weight assigned to specific success factor, the higher the influence/ effect of that specific success factor on the performance of the project and vice versa.

Then relative importance index was calculated for each criterion by using equation 3.1

$$RII = \left( \frac{\sum w}{5 * N} \right) * 100, (0 \leq RII \leq 100) \dots\dots\dots [Equation 3.1]$$

Where;

- RII is relative importance index
- W is the weight given to each by each attribute by the respondent differs between 1 and 5
- N is number of respondent
- 5 the maximum weight that can be assigned to factors

Then, the higher the RII, the more influential the success factor is and become critical to the performance of the projects called critical success factors (CSFs).

### **3.6 Data entry and analysis**

Data entry and analysis was done using SPSS version 25.0 for windows. The data was double entered and cleaning was done. The generated data is compiled by frequency tables, charts, and graphs. Descriptive statistics such as mean, variance and related statistics are used to present the results.

## CHAPTER 4 RESULTS, DATA ANALYSIS AND INTERPRETATION

### 4.0 Introduction

This chapter presents analysis of the performance and associated factors of rural road construction under URRAP in Wolaita Zone. The chapter designed in the way that data is related systematically to research method selected for the study.

Questionnaires were sent to 48 owners and employees of contractors, 18 Consultant members, 23 Engineers working at different positions with client who are from Ethiopian Roads authority, SNNPRG Transport Bureau, Wolaita Zone and Woreda Road and Transport Offices, 13 experts in engineering who previously have experience in URRAP and working as University lecturers, with private consultants and material and/equipment suppliers during the time of data collection. Out of 102 study participants 78, which is about 76.5% have responded.

Table 12 - Number of respondents and response rate

S. No.	Stakeholders respondents represent	Total questionnaire distributed	Questionnaire returned in number	Questionnaire returned in percent in terms of stakeholders	Questionnaire returned in percent with total number of returned questionnaire (78)
1	Client	23	18	78.26	23.08
2	Contractor	48	33	68.75	42.31
3	Consultant	18	16	88.89	20.51
4	Others (University lecturers, etc.)	13	11	84.62	14.10
	Total	102	78		100

### 4.1 Background of respondents

Background of respondents includes the stakeholders the respondents are working for, their position (title) in the organization, profession (area of specialization), the total

number of years of experience they have in construction industry and the total number of years of experience they have in URRAP projects.

#### 4.1.1 Educational background of respondents

Educational background of respondents in a research is necessary to collect trustworthy response. Accordingly, 92.3 percent of respondents have BSC degree and above which make the respondents better candidates for the research as they better analyze the situation.

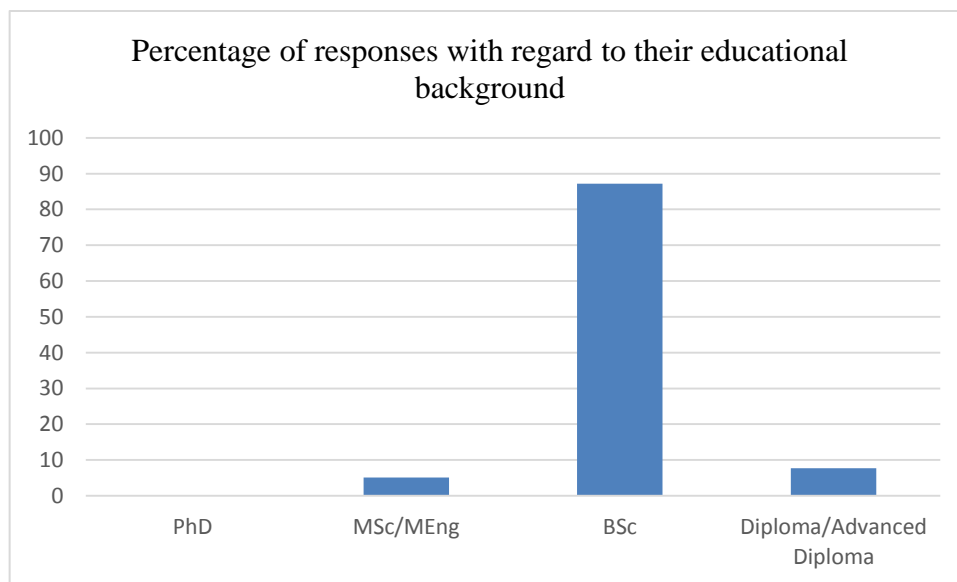


Figure 3 – percentage of responses with regard to educational background

#### 4.1.2 Position of respondent in the Organization

It is important to involve respondents who have better knowledge on URRAP in this research. As shown in the table 12 below, General Managers, Material Engineers, clients regional and central government URRAP section heads, Process Owners and team leaders whom have deep knowledge, skill and experience in URRAP have greater share which is about 69 percent of total respondents. This shows that most of respondents have deep knowledge about the industry and URRAP in specific.

Table 13 - Position of respondents in the organization

S. No.	Position of respondents in the organization	Number of respondents	Percentage of respondents against total
1	General Managers and material Engineers of contractors and consultants including ERA, regional and Zone URRAP section heads, Process Owners, team leaders	54	69.23
2	Superintendent from contractor, Surveyors of contractor and consultant, supervisors from client, site engineers from contractor, resident engineers from consultant	24	30.76
	Total	78	100

#### 4.1.3 Area of specialization or profession of respondents

Table 13 shows area of specialization of respondents. Among the total respondents, 89.74 percent of respondents' area of specialization is civil engineering and related fields.

Table 14 - Area of specialization or profession of respondents

S. No.	Area of specialization	Number of respondents	Percentage of respondents to total number of responses
1	Civil Engineering, Road & Transport Engineering, Construction Technology and Management and related fields	70	89.74
2	Building Engineering, Surveying Technology, Building Construction	8	10.26
	Total	78	100

Table 13 above shows 89.74 percent of respondents are specialized in Civil Engineering, Road and Transport Engineering, Construction Technology and Management and related fields which are specific to URRAP.

#### 4.1.4 Experience of respondents in construction industry

To collect trustworthy response, the experience of the respondents is necessary. General experience and experience in URRAP of the respondents are shown in the following tables.

##### 4.1.4.1 General experience of respondents in construction industry

Table 14 below shows the proportion of experiences of respondents with in the ranges of years stated. As it can be seen that 74.36 percent of respondents have more than 10 years of experience in construction industry which shows that they have adequate knowledge about construction industry of Ethiopia.

Table 15 - General Experience of respondents in construction industry

S. No.	Number of years of experience in construction industry	Number of respondents	Percentage of responses with regard to total number of respondents
1	$\leq 1$	1	1.28
2	$1 < X \leq 5$	6	7.69
3	$5 < X \leq 10$	13	16.67
4	$10 < X \leq 15$	49	62.82
5	$15 < X \leq 20$	9	11.54
6	$> 20$	0	0
	Total	78	100

##### 4.1.4.2 Experience of respondents in URRAP

Table 15 below shows experiences of respondents in URRAP with in the ranges of years stated. As it can be seen that 75.64 percent of respondents have experiences of more than 5 years in URRAP. Contractors are consultants are working in URRAP from the time of implementation of first phase projects in Wolaita Zone which make them to have deep knowledge about the performance of projects. Representatives of clients who are involved in these projects are also having similar experiences in URRAP.

Table 16 - Experience of respondents in URRAP

S.	Number of years of	Number of	Percentage of responses with
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No.	experience in construction industry	respondents	regard to total number of respondents
1	$\leq 1$	1	1.28
2	$1 < X \leq 5$	18	23.08
3	$5 < X \leq 10$	59	75.64
4	$10 < X \leq 15$	0	0
5	$15 < X \leq 20$	0	0
6	$> 20$	0	0
	Total	78	100

#### **4.2 Performance of rural road constructed under URRAP in Wolaita Zone**

This section discusses the results of responses up on main criteria to assess the performance of projects. Based on the responses collected, overall performance of the program with regard to four criteria which are relevance, effectiveness, efficiency and sustainability, the performance of the program with regard to each criterion and the performance of the program with regard to each stakeholder the respondents are working for is discussed below. The results of analysis are shown in table 16 below.

Table 17 - Performance of rural road constructed under URRAP in Wolaita Zone

Stakeholder	Relevance			Effectiveness			Efficiency			Sustainability			Overall Performance
	Weight	Mean	Performance	Weight	Mean	Performance	Weight	Mean	Performance	Weight	Mean	Performance	
Client	0.295	1.34	0.40	0.205	2.62	0.54	0.235	2.47	0.58	0.265	1.34	0.36	1.87
Consultant	0.295	1.31	0.39	0.205	2.79	0.57	0.235	2.65	0.62	0.265	1.05	0.28	1.86
Contractor	0.295	1.29	0.38	0.205	2.72	0.56	0.235	2.57	0.60	0.265	1.13	0.30	1.84
Others	0.295	1.20	0.35	0.205	2.78	0.57	0.235	2.71	0.64	0.265	1.06	0.28	1.84
Mean		1.29	0.38	0.21	2.73	0.56	0.24	2.60	0.61	0.27	1.15	0.30	<u>1.85</u>
When the performance is evaluated with regard to each criterion (4*Mean of Means)			<u>1.52</u>		<u>2.24</u>			<u>2.44</u>			<u>1.21</u>		

#### 4.2.1 Overall performance of rural road constructed under URRAP in Wolaita Zone

The ‘Weight of criteria’ shown in table are taken from table 4 of chapter three. Mean of sub criteria is the mean aggregated from the responses of each sub criteria under main criteria. Accordingly, performance is calculated as follows.

$$P=(WR*MR) +(WE*ME) + (WEf *MEf) +(WS+MS) \dots\dots\dots [Equation 4.1]$$

Where,

P – Performance of URRAP in Wolaita Zone

WR, WE, WEf and WS are weights of relevance, effectiveness, efficiency & sustainability respectively

MR, ME, MEf and MS are means of responses of sub criteria under relevance, effectiveness, efficiency & sustainability respectively

Accordingly,

$$P= (0.295*1.29) +(0.205*2.72) +(0.235*2.58) +(0.265*1.15)$$

$$P=1.85$$

Table 18 - Overall performance of URRAP in Wolaita Zone

S. No.	Criteria	Weight of criteria	Mean of sub criteria	Weighted mean of sub criteria (Performance)
1	Relevance	0.295	1.29	0.38
2	Effectiveness	0.205	2.72	0.56
3	Efficiency	0.235	2.58	0.61
4	Sustainability	0.265	1.15	0.30
	Total Performance of the Program			1.85

As it can be seen from table 17, the overall performance of rural road constructed under URRAP in Wolaita Zone is 1.85, which in the range of  $1.6 \leq X < 2.7$ . Then, according to the guideline of Asian Development Bank, ADB, rural road constructed under URRAP in Wolaita Zone is successful. The result shows that there is no major deficit in the performance. Expected output would entirely be achieved.

But it shows that there are some negative results which are small in relation to the gains of the project that prevent a rating of highly successful. That is even though the program could entirely be successful; the result 1.85 shows that it is far away from 3, which is highest performance to be achieved. This shows that there is deficit in performance in some areas and the following sections discuss about the success and failure with regard to each criterion and stakeholders the respondents represent.

#### **4.2.2 Performance of rural road constructed under URRAP in Wolaita Zone with regard to each criterion**

The following sections presents results with regard to four criteria used to assess performance of rural road constructed under URRAP in Wolaita Zone, which are relevance, effectiveness, efficiency and sustainability. Table 18 below shows performance of rural road constructed under URRAP in Wolaita Zone with regard to each criterion.

Table 19 - Performance of rural road constructed under URRAP in Wolaita Zone with regard to each criterion

S. No.	Criteria	Weighted mean of responses	Performance of project evaluated by each criterion alone (Weighted Mean*4)
	Relevance	0.38	1.52
	Effectiveness	0.56	2.24
	Efficiency	0.61	2.44
	Sustainability	0.30	1.21

##### ***4.2.2.1 Performance of URRAP in Wolaita Zone with regard to relevance***

From 78 responses for 16 sub criteria, the performance of rural road constructed under URRAP in Wolaita Zone when evaluated with regard to relevance only is 1.52 as shown in table 18, which shows it is within the range  $0.8 \leq X < 1.6$ . It reveals that, the output of some component of the project is approximately half the level of original plan or expectation. Therefore, according to the guideline of ADB, the performance is less than successful when evaluated against relevance.

In other word, it is possible to conclude that works necessary to ensure the relevance of the projects were not done to the required level. The overall performance of program would be better than what it is if works related to relevance were appropriately done before commencement.

The mean of responses of the highest three and the lowest three sub criteria of relevance are shown in table 19.

Table 20 - The mean of the responses on sub criteria of relevance

S. No.	Sub criteria of relevance	Mean
1	The output and outcome of a project is consistent with government and donors long term development strategy and Millennium Development Goal, MDG	2.57
2	Timing of intervention is appropriate	1.92
3	Results expected from the program/projects are clearly stated	1.79
4	Alternative responses to the identified problem are properly considered	0.65
5	Risk mitigation measures are adequately proposed	0.56
6	Risk analysis is conducted adequately and in good quality to support each necessary and sufficient condition	0.51

As it can be seen from the table above, mean for sub criteria named ‘the output and outcome of a project is consistent with government and donors long term development strategy and Millennium Development Goal, MDG’ is 2.57 which is far more than the mean of all sub criteria, which is 1.29. This shows that URRAP in Wolaita Zone is consistent with the government development strategy and Millennium Development Goal, MDG. Fifty-nine percent of total respondents have assigned 3, which is the maximum value allotted for this sub criterion. This means that, majority of respondents believe that the projects (program) is consistent with the strategy of Ethiopia.

On the other hand, for risk analysis which needs to be conducted in good quality and adequately before the implementation of the project to support each necessary and sufficient condition is the least ranked with mean of 0.51. Fifty-six point four percent of

the respondents assigned 0 (zero) for this sub criteria. This shows that sufficient risk analysis had not been conducted before implementation of the program.

#### ***4.2.2.2 Performance of URRAP in Wolaita Zone with regard to effectiveness***

The mean of responses for 36 sub criteria under effectiveness calculated is 2.24 as shown in table 18. This value is in the range of  $1.6 \leq X < 2.7$ . That is successful according to the guideline of ADB which is shown in table 2. The value describes that there is no major deficit. Expected output would entirely be achieved, but there are some negative results which are small in relation against the gains of the project that prevents rating of highly successful. Table 20 shows six sub criteria, three of which are with highest mean and the remaining three have the lowest mean.

Table 21 - Performance of URRAP in Wolaita Zone with regard to effectiveness

S. No.	Sub criteria of effectiveness	Mean
1	The program/projects reflect and match the desires of beneficiaries at local level	2.98
2	The program/projects integrate, recognize and complement with other Woreda and Keble infrastructure investments	2.97
3	Length of all-weather access road constructed or rehabilitated to a serviceable condition complies with the plan	2.96
4	The ability of fund raising and financial allocation at Woreda level for road administration complies with the plan	2.43
5	The program has adopted sustainable rural road maintenance management strategies	2.42
6	The number of small and medium scale private enterprises promoted to the second level complies with the plan	2.41

As it can be seen from the table above, the mean of responses for the ability of projects to reflect the desire at local level is 2.98, which is greater than the mean score of effectiveness (2.72) and closer to 3, which is the maximum score. This means, the project demand is high at local level. From 78 respondents 77 (98.7%) have assigned 3, which is the highest value for the ability of a program to reflect and match the desires of beneficiaries at local level.

The ability of a program to integrate, recognize and complement with other Woreda and Keble infrastructure investments becomes the next higher scorer with the mean of responses of 2.97 by assignment of 3 by 76 (97.4%) of respondents. The program is evaluated to be successful in terms of constructing all-weather access road more than the plan with the mean score of 2.96 which is still greater the mean score of effectiveness (2.72). This was substantiated from the eight years' cumulative report prepared at the end of June, 2020 by SNNPRG transport bureau as the plan was 350 Km, whereas accomplishment was 467.95 Km, which is 117.95 Km more than the plan.

In contrary, the program is evaluated to be least effective in terms of its' adoption of sustainable rural road maintenance management strategies with mean score of 0.76 which comes after the least effectiveness in terms of promotion of the number of small and medium scale private enterprises to the second level when compared to plan, which is 0.78.

#### ***4.2.2.3 Performance of URRAP in Wolaita Zone with regard to efficiency***

The program is efficient as it has mean score of 2.44 when it is evaluated towards sub criteria under efficiency. The mean score of efficiency is in the range  $1.6 \leq X < 2.7$ , which is successful according to the guidelines of ADB. This means that the expected output and outcome would be achieved and remains efficient in its operations and implementation. But there are some adverse effects which are small in relation the gains of the project.

The mean score of the sub criteria under efficiency are shown in table 21 for further discussion.

Table 22 - Performance of URRAP in Wolaita Zone with regard to efficiency

S. No.	Sub criteria of efficiency	Mean
1	The capital invested in the construction/rehabilitation of URRAP roads is less than the investment in similar roads in other program	2.68

S. No.	Sub criteria of efficiency	Mean
2	The output of the project is high compared with similar projects under another program for similar resource utilization	2.63
3	The output of the project is high compared with the plan within planned resource utilization	2.60
4	Internal rate of return, IRR of project is higher than opportunity cost of capital	2.59
5	Cost performance index of the project, which is the ratio of budgeted cost of the work performed to actual cost of work performed is greater than one	2.50
6	Schedule performance index of the project, which is the ratio of budgeted cost of the work performed to budgeted cost of work scheduled is greater than one	2.48

The amount of capital invested in the construction of URRAP roads is less than the investment in similar roads in other program is one sub criteria under efficiency for which the mean of 78 responses are averaged to 2.68 which is greater than the mean score of efficiency (2.58). Fifty-Six (71.8%) responses ensured that the construction of URRAP roads in Wolaita Zone is less capital intensive than construction of rural roads in other programs by allocating 3. From 78 responses, 19 (24.4%) has assigned 2 and the remaining 3.8% has assigned 1 for the less capital consumption of URRAP.

The second highest scorer sub criteria of efficiency with mean score of 2.63, which is greater than the mean score of efficiency, is about the amount (quantity) of output when compared with other similar projects under another program for the same resource utilization. Fifty-two respondents (66.7%) have assigned a score of 3, 23 respondents (29.5%) have assigned 2 and the remaining 3 respondents (3.8%) have assigned 1 for assurance of higher output of URRAP roads construction in Wolaita Zone.

In contrast, schedule performance index of the project, which states that ratio of budgeted cost of the work performed to budgeted cost of work scheduled, is evaluated relatively to be the least scorer with mean score of 2.48, which is less than the mean score of efficiency (2.58). Forty-five respondents (57.7%) have assigned score of 3 for

this sub criteria. 26 respondents (33.3%) have assigned the score 2 and the remaining 7 (9%) respondents have assigned 1.

There are 53 rural road projects constructed under URRAP in Wolaita Zone starting from February, 2012 to June, 2020. These 53 projects have different cost performance index. For instance, Waraza Shola to Baqlo Sagno URRAP road construction, which has been visited by the Author of this research, is the road with cost performance index of 1.2 as checked from the document of contractor. In contrast, some roads have cost performance index of less than 1 like the road that stretches from Humbo Tebela to Hobicha. These are the reasons for the variation in scoring of cost performance index as well as other efficiency evaluating criteria though efficiency needs to be said either of efficient or inefficient.

#### ***4.2.2.4 Performance of URRAP in Wolaita Zone with regard to sustainability***

The mean score of sustainability is 1.21 which is the least out of all relevance, effectiveness and efficiency. The mean score of sustainability is in the range  $0.8 \leq X < 1.6$ . A program is less than successful when separately evaluated towards sustainability. That means, the output of some component of the project is approximately half the level of original plan or expectation and there is substantial deficit in achieving planned outcome as per the guideline of ADB.

The mean score of the three highest and lowest sub criteria under sustainability are shown in the following table for further discussion.

**Table 23 - Performance of URRAP in Wolaita Zone with regard to sustainability**

S. No.	Sub criteria of sustainability	Mean
1	There is adequate demand for the project output	2.73
2	The price of output is affordable to beneficiary	2.65
3	Beneficiaries or end users are profitable by using the output	2.48
4	Policies, institutions, markets, the regulatory conditions and the risks of change are adequate to ensure the sustainability of roads	0.45
5	Operating or service entities are capable to apply appropriate policies to ensure maintenance and availability of human resources	0.43
6	There are appropriate policies and procedures to ensure continued funding for operation and maintenance of the output.	0.41

Sustainability, in contrast, has sub criteria with highest difference in between highest mean score and lowest mean score which is 2.32. The first three which are shown in the table 22 above with highest mean score are about the demand of the project and its' affordability by society, whereas, the last three with the least mean score are about works that need to be done to make the output sustainable.

For a project to be sustainable, it is necessary to have adequate demand for the output of it. Accordingly, 61 respondents (78.2%) have assigned 3, 13 respondents (16.7%) have assigned 2 and the remaining 4 respondents (5.1%) have assigned a score of 1 which has a mean of 2.73, which is far greater than the mean score of sustainability (1.15). If the program could have been evaluated by using this sub criterion alone, the performance becomes highly successful.

Another sub criterion of sustainability for which high mean has been scored is about the affordability of price of output to beneficiary. The relationship between affordability and sustainability of a project is that, as long as the price of a project is affordable, then the probability of increment of demand is high and so are works needed to ensure the sustainability. Accordingly, the mean score about the affordability of the price of the output of project to beneficiary 2.65. It is the mean calculated from the responses of 3

from 57 (73.1%), 2 from 15 (19.2%) and 1 from 6 (7.7%) which shows that most of the respondents believe that the price of output is affordable by customaries that can contribute the sustainability of the project.

On the other hand, all respondents, by scoring 0 to 1, revealed that there is lack of appropriate policies and procedures to ensure continued funding for operation and maintenance of the projects to sustain its' output for the intended life. Forty-six (59%) respondents have assigned 0, whereas, 32 respondents (41%) have assigned 1. The mean, which is 0.41 is the least of all sub criteria in any of four criteria which shows that the lack of appropriate policies and procedures to ensure sustainability is great shortfall of URRAP in Wolaita Zone.

Another sub criterion that shows the insufficiency of work to ensure sustainability of project is related with capacity of operating or service entities. The plan of ERA was to preserve assets through streamlining of sustainable maintenance and management systems through length-man approach [21]. But the government entities managing the program were not able to attain this plan yet. Related with capacity of entities, the scores of the respondents have a mean of 0.43, which is less than the mean of sustainability (1.15). Forty-six (59%) respondents have assigned 0 and 32 (41%) respondents have assigned 1. The frequency of responses show that more than half of the respondents have assigned a score of 0 to ensure that the capacity of operating entity is not able to ensure the sustainability of projects.

#### **4.2.3 Performance of rural road constructed under URRAP in Wolaita Zone with regard to each stakeholders**

It is better to show the performance of rural road constructed under URRAP with regard to stakeholders the respondents are working for as their perspective may vary with regard to whom they are working. Accordingly, the following table shows the result.

Table 24 - Performance of rural road constructed under URRAP with regard to each stakeholder

S. No.	Stakeholder	Performance with regard to relevance	Performance with regard to effectiveness	Performance with regard to efficiency	Performance with regard to sustainability	Overall performance
1	Client	0.40	0.54	0.58	0.36	1.87
2	Consultant	0.39	0.57	0.62	0.28	1.86
3	Contractor	0.38	0.56	0.60	0.30	1.84
4	Others	0.35	0.57	0.64	0.28	1.84
	Mean	0.38	0.56	0.61	0.30	1.85

As it can be seen from table 23 above, there is no significant variation among different stakeholders about performance.

### **4.3 Success factors affecting the construction of rural road under URRAP in Wolaita Zone**

The second objective this research is to identify critical success factors for URRAP in Wolaita Zone. As described in chapter three of this research work, ninety-four success factors which can affect performance of construction projects are collected from literature, from past experience and suggestion of experts. Then, they are categorized under Client related, Contractor related, Consultant related, Project related and External environment related based on the result of focal group discussion. The listed success factors without categorization were distributed to respondents to assign value from 1 to 5 as per their least to highest effect and the result of analysis of data by IBM SPSS version 25 is presented below.

#### **4.3.1 Critical success factors affecting the construction of rural road under URRAP without categorization**

Top twenty success factors are presented below based on their mean. These twenty success factors are presented without categorization. They are ranked based on their relative importance index by using equation (1) of chapter three. Accordingly, success

factors which are believed to be highest influential with relative importance index, RII of 86.41 to 71.54 are ranked top 20 as shown in the following table. Total success factors with their rank are shown in the appendix 2.

Table 25 - Top twenty critical success factors that affect the performance of URRAP in Wolaita Zone

Rank	Success factors	Minimum	Maximum	Mean	RII
1	Financial capacity of client /Timely payments	3.00	5.00	4.32	86.41
2	Timely delivery of design, specification and related documents	2.00	5.00	4.21	84.10
3	Availability of liquid asset and/or cash flow management	2.00	5.00	4.19	83.85
4	Effective project team formation, commitment and motivation of the team	2.00	5.00	4.17	83.33
5	Manpower/labor productivity	2.00	5.00	4.12	82.31
6	Technical capacity of contractor	2.00	5.00	4.04	80.77
7	The time taken for scope change, design and specification approval	2.00	5.00	4.03	80.51
8	Commitment of consultant to meet project objectives	2.00	5.00	3.99	79.74
9	Effective project contract management system	2.00	5.00	3.92	78.46
10	Repeated change of design during construction	2.00	6.00	3.88	77.69
11	Ability of contractor for having detailed project planning/estimations and scheduling	1.00	5.00	3.78	75.64
12	Design errors/mistakes and discrepancies	1.00	6.00	3.78	75.64
13	Change control, risk identification and management effectiveness of consultant	2.00	6.00	3.77	75.38
14	Project monitoring/progress meetings	2.00	5.00	3.74	74.87
15	Availability of experienced and skillful manager/team leader	1.00	5.00	3.72	74.36
16	Clients characteristic (risk attitude, emphasis on low cost,	2.00	5.00	3.71	74.10

Rank	Success factors	Minimum	Maximum	Mean	RII
	quality, speed etc.)				
17	Availability of resources as planned throughout the project	2.00	5.00	3.64	72.82
18	The time taken for decision making	2.00	5.00	3.59	71.79
19	Allocation of manpower on the right activity in the right time	1.00	5.00	3.59	71.79
20	Capability of contractor to coordinate Subcontractor	1.00	5.00	3.58	71.54

From top 20 critical success factors, top 5 are discussed in the following sections.

Discussions are mainly focused on the stakeholder the respondents are working for, the educational back ground of the respondents and the experience the respondents have in rural road construction under URRAP. These three demographic backgrounds are selected for the discussion because of their effect in the credibility of responses. A respondent having experience in URRAP can better understand the effects of each factor on the success of project than a respondent who does not have experience on it. On the other hand, responses from the respective stakeholders need to be considered to test their agreement on the degree of influence of specific success factor. Educational background is also necessary to assess the in-depth analysis of the effect.

Therefore, the following sections discuss about the responses by considering demographic backgrounds of the respondents who were participating in rural road construction under URRAP.

#### ***4.3.1.1 Timely payments***

A timely payment is ranked to be the first with RII of 86.41%. Sixty-nine respondents (85.2%) believe that financial capacity of client/timely payments is critical for the performance of the project by weighing 4 & 5. Out of the total 78 respondents, 34

respondents (42%) believe that a timely payment is critical for the performance by allotting 5.

When the client can be able to pay payments as per the contract time, the execution of project becomes successful and vice versa. Contractors and consultants who have been participating in URRAP do not have sufficient liquid asset (cash flow) as they were new to the program as an entity/firm. Due to this, their cash flow is dependent on the payment from client. But according to the respondents, payments were delaying for weeks, even sometimes for months, in which case most activities on site have been delaying. Though lack of timely payment is not the only cause for shortfall in the performance of URRAP in Wolaita Zone, it the most of all critical success factor which has the highest impact than others. Therefore, this shows that client needs to be focused on timely payment for the success of projects.

The proportion of the respondent as per their demographic background are shown below. In the following bar chart the mean of responses with regard to the stakeholders the respondents are working for and experiences in URRAP are shown. In both cases, the mean of the response is entirely more than 4. This shows that financial capacity of client/timely payments is critical for the success of projects.

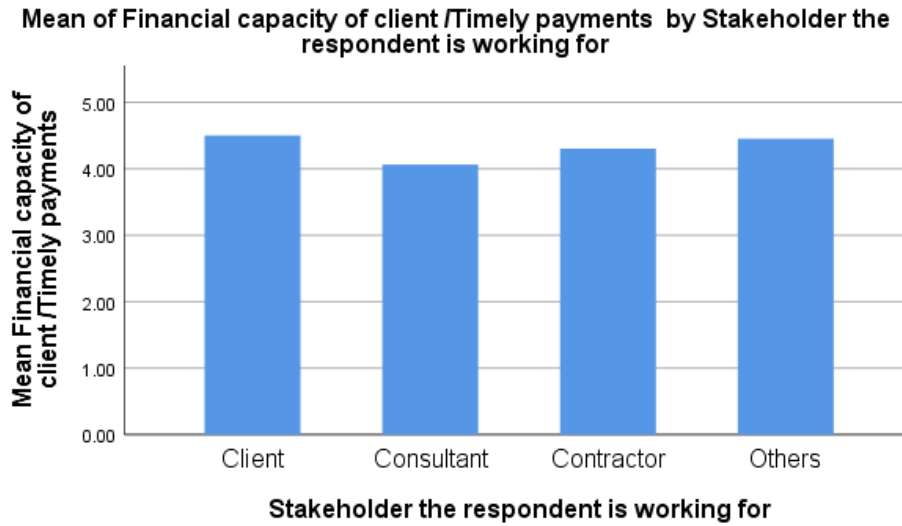


Figure 4 - Responses towards financial capacity of client against the stakeholder respondents are working for

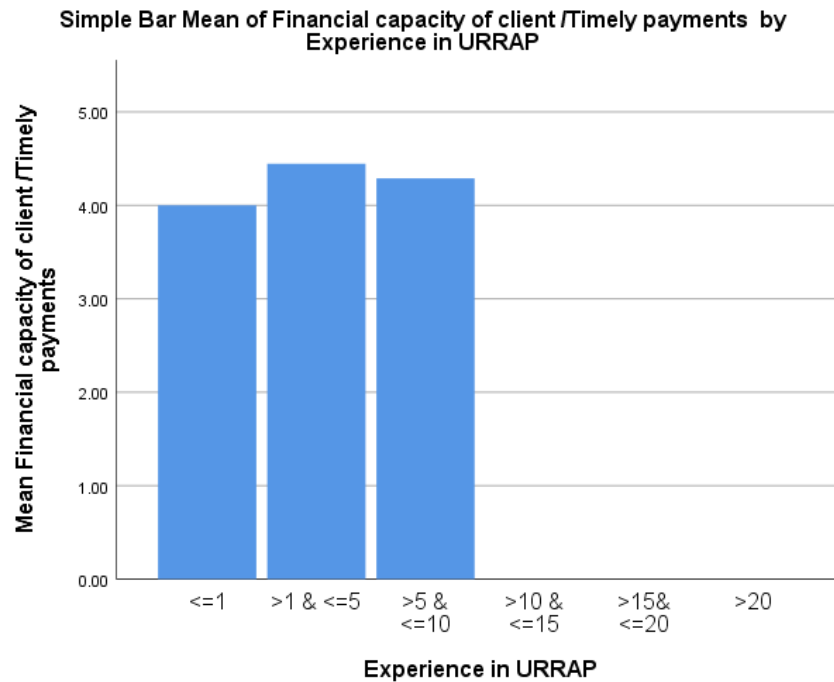


Figure 5 - Responses towards financial capacity of client against experience of respondents in URRAP

#### *4.3.1.2 Timely delivery of design, specification and related documents*

Timely delivery of design, specification and related documents is the second most critical success factor with RII of 83.85%, which is 0.25% less than RII of that of the highest critical success factor. As per the information gathered by the Author of this research work, consultants were expected to deliver the design of URRAP roads after conclusion of contract between client and contractor. The specification, bill of quantities and related technical documents, based on which the contractor and client made an agreement is the estimation which has been tried to accommodate excavation types and other variables expected on the site.

Then, it is the consultant who was responsible to deliver the detail design of the site. Consultant was required to provide detail design based on all necessary site conditions by conducting any appropriate tests and investigations. Then, design has been approved by client before it delivered to site. If either of client or consultant could delay any of activities expected from them, the project would be delayed. In opposite, if these activities would be executed in the reasonable time, the project would also proceed as expectation.

That is why 64 respondents (79%) believe that timely delivery of design, specification and related documents is critical for the success of the project by weighing 4 & 5. Out of the total 78 respondents, 31 respondents (38.3%) believe that timely delivery of design, specification and related documents is critical for the performance by assigning 5.

As it can be seen from the following figure, respondents have assigned 4 and more than 4 for timely delivery of design, specification and related documents as critical success factor regardless of stakeholder they are working for. But, 1 respondent who have experience of less than a year in URRAP responded a score of 3 for timely delivery of design, specification and related documents.

As briefly discussed above timely delivery of design, specification and related documents is the second most critical success of URRAP in Wolaita Zone. As far as the responsible stakeholder separately or all stakeholders together whenever necessary can manage to work together to deliver design, specification and related documents on time, the project will be successful than it is this time.

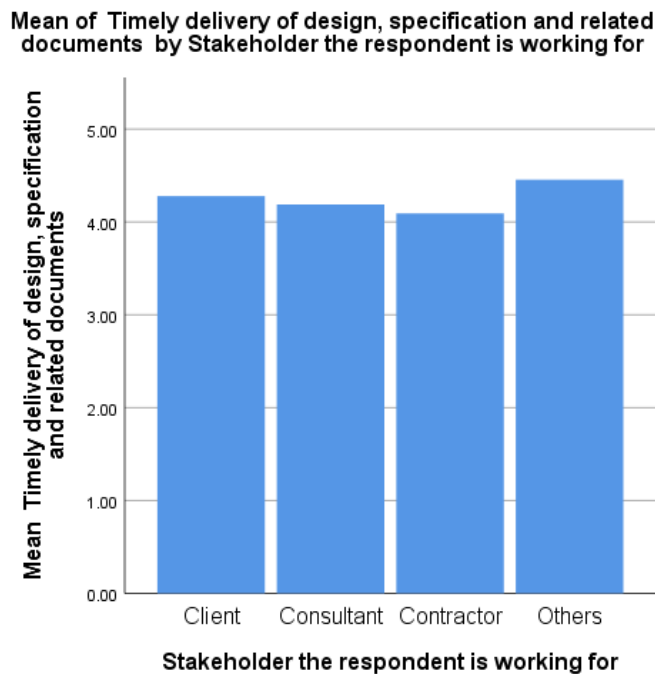


Figure 6 - Responses towards delivery of design and related documents against the stakeholder respondents are working for

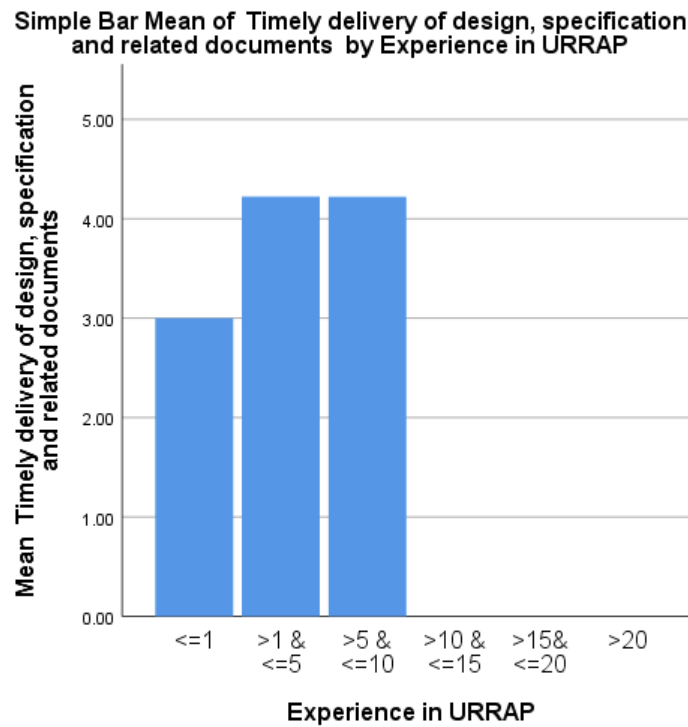


Figure 7 - Responses towards delivery of design and related documents against experience of respondents in URRAP

#### ***4.3.1.3 Availability of liquid asset and/or cash flow management***

Availability of liquid asset and/or cash flow management is the third critical success factor for the performance of URRAP in Wolaita Zone with RII of 83.85. It is not a surprise for availability of liquid asset and/or cash flow management for being the third critical success factor in URRAP as it commonly is for many construction projects. Contractors should have adequate liquid asset for expenses related with fuel, manpower, rent of equipment and related demand expenditures.

As briefly described in section above, contractors involved in the construction of URRAP roads in SNNPRG including Wolaita Zone were new to enter into the program as entity/firm. So, the expenditure which needs cash would most probably be covered by the payment collected from client. When the contractor can be able to manage its'

finance wisely, then expenditures that need cash can easily be managed so that the performance of the project is enhanced.

From the analysis result of IBM SPSS version 25 about the criticality of availability of liquid asset and/or cash flow management it can be seen that 65 respondents (80.3%) believe that availability of liquid asset and/or cash flow management is critical for the success of the project by weighing 4 & 5. Out of the total 78 respondents, 34 respondents (42%) believe that availability of liquid asset and/or cash flow management is critical for the success of the program by assigning 5, which is maximum. Additional discussion about availability of liquid asset and/or cash flow management as success factors are presented in the figure below.

The following bar charts that respondents have assigned 4 and more than 4 regardless of whom they are working for as critical, which makes it the third critical success factor. But, 1 respondent who have experience of less than a year in URRAP have responded a score of 3 for availability of liquid asset and/or cash flow management.

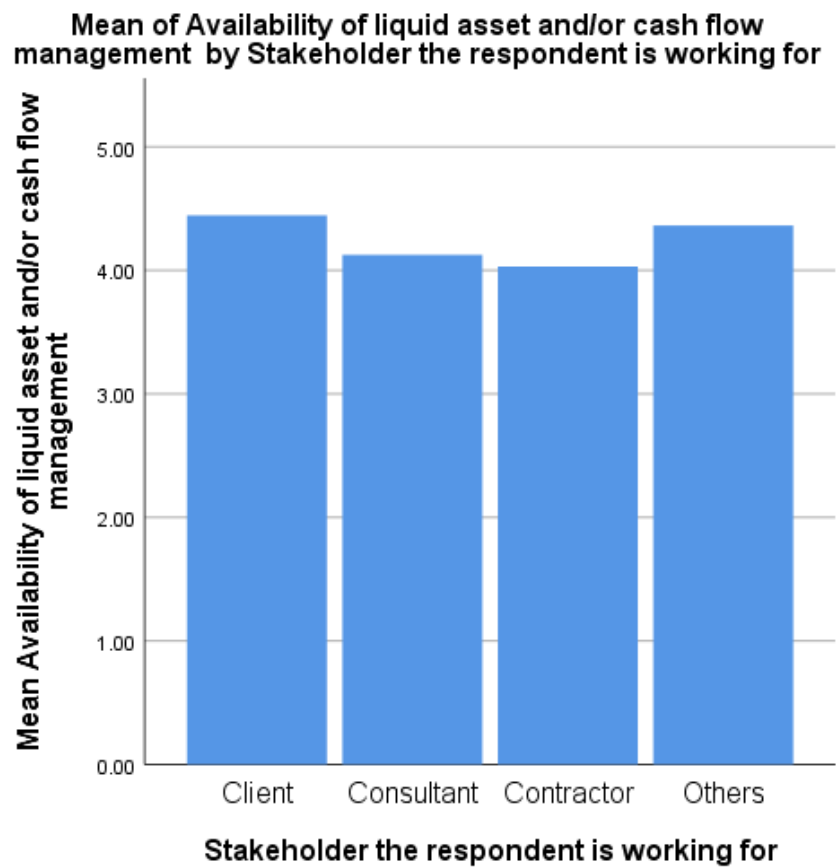


Figure 8 - Responses against availability of liquid asset or cash flow management with regard to stakeholder the respondents are working for

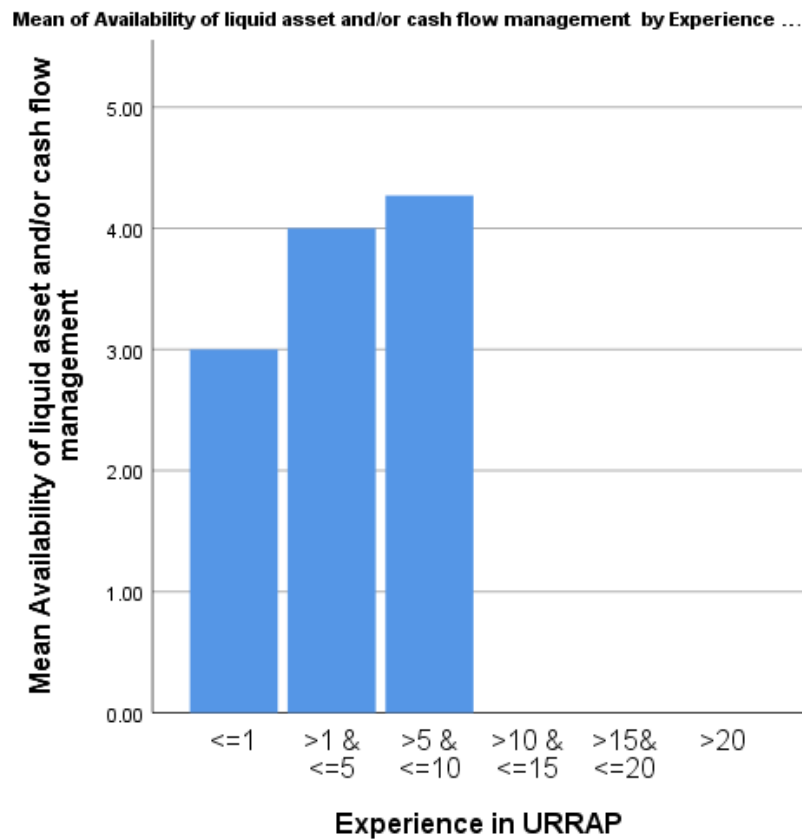


Figure 9 - Responses against availability of liquid asset or cash flow management with regard to experience of respondents in URRAP

#### ***4.3.1.4 Effective project team formation, commitment and motivation of the team***

Effective project team formation, commitment and motivation of the team is the fourth critical success factor with RII of 83.33%. It is known that the right team, in the right work activity in the right time is mandatory for the success of project. Labor productivity depends on the formation of team with all necessary varieties as demanded by the work. When a contractor can be able to form effective team, then there is high contribution for the success of the project.

Effective project team formation alone might not be sufficient to attain the objectives of the project. Commitment and motivation, especially in the course of execution of construction project, also is necessary to achieve team output as expectation as or more than the expectation.

Contractors are left with much to do in team formation as well as motivation of the team to increase the productivity according to experts working in Transport office of Wolaita Zone. Most contractors have lack of experience in team formation. Therefore, finally the team productivity becomes less than the expectation and the opposite is true for certain contractors.

That is why the results of the analysis of the responses of effective project team formation, commitment and motivation of the team shows that it is the fourth most critical success factor which is 0.77% less than critical success factor which has the highest RII. The following paragraphs discusses about the responses with regard to the stakeholder respondents are working for, educational background and experiences the respondents have in URRAP.

The responses about effective project team formation, commitment and motivation of the team related with the stakeholder the respondents are working for and the experience they have in URRAP are presented by the following figures.

Except respondents working for contractor, the remaining respondents who are working for client, consultant and others have scored 4 and above for effective project team formation, commitment and motivation of the team as it has high influence on the success of projects. The respondents from contractor also assigned a score whose mean is slightly lower than 4. As effective project team formation, commitment and motivation is a factor related with contractor, it assumed that the respondents took it as less critical to the success of project.

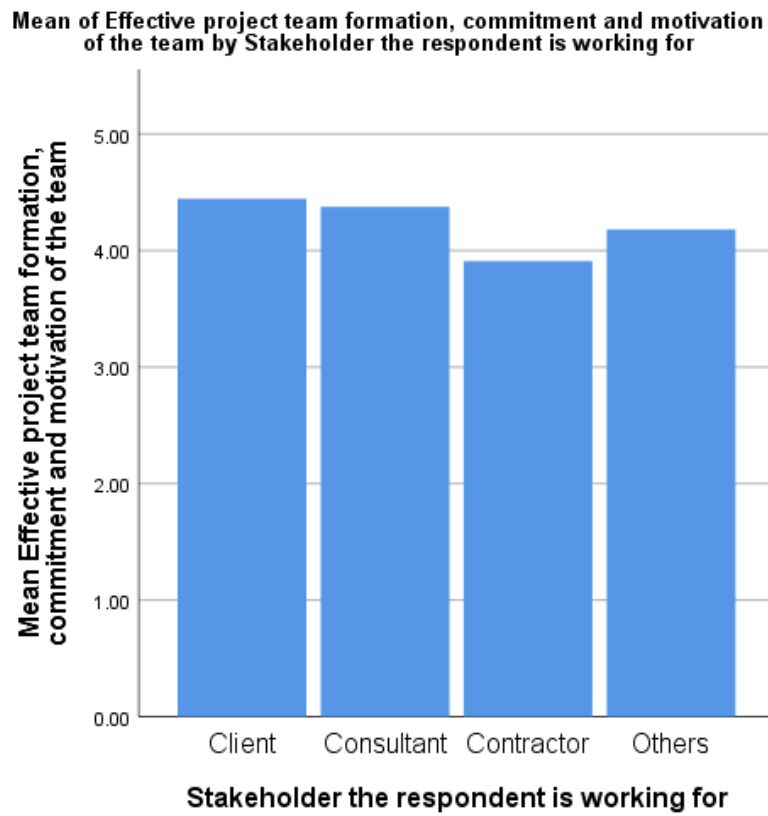


Figure 10 - Responses towards effective team formation against the stakeholder respondents are working for

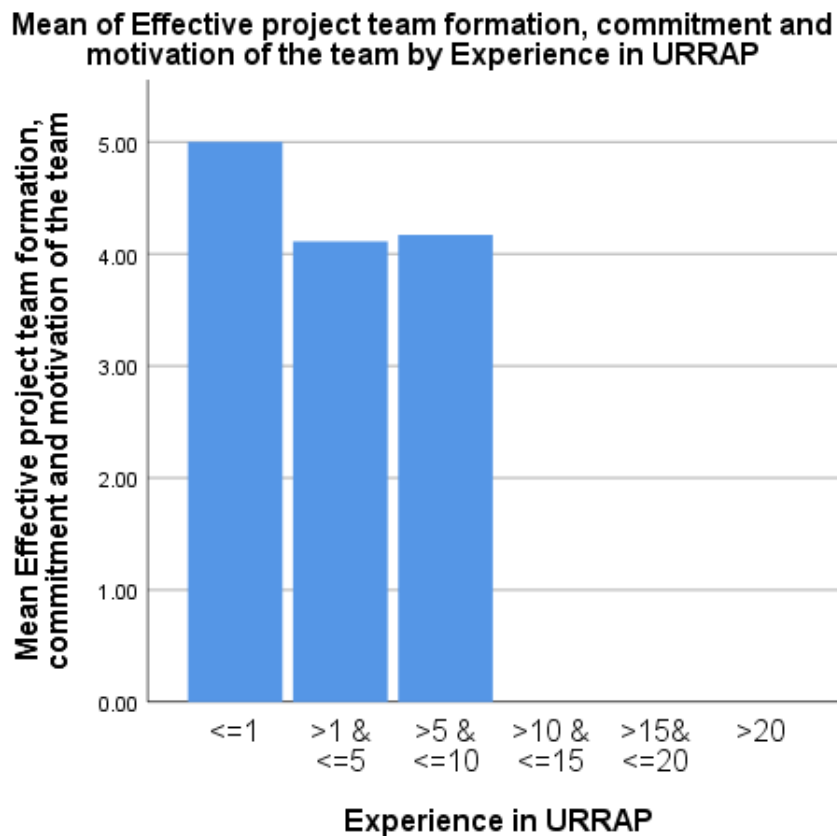


Figure 11 - Responses towards effective team formation against experience of respondents in URRAP

#### ***4.3.1.5 Manpower/labor productivity***

Labor productivity is the fifth highest critical success factor of rural road construction under URRAP in Wolaita Zone with RII of 82.31%. Since, URRAP is labor based and labor intensive than other road construction, labor productivity is crucial for overall success of a project. One of objectives of URRAP in entire country is to create job opportunities. These job opportunities were planned for both temporary and permanent, for both skilled and unskilled.

If the planning of URRAP was to build roads based on labor and minor construction equipment, then the manpower/ labor productivity is unquestionable for profitability of the contractors'. That is why manpower/labor productivity is ranked fifth critical success factor for rural road construction under URRAP in Wolaita Zone.

52 respondents (64.2%) have assigned a score of 4 to 5, and 37 respondents (45.7%) have assigned 5 which were allotted for the highest score that shows the high degree of influence of a specific success criterion. The remaining 32.1% have assigned scores 2-3. Respondents working with client, consultant and others have assigned scores whose mean is more than 4 for manpower/labor productivity. But the respondents working with contractor have assigned score whose mean is slightly less than 4.

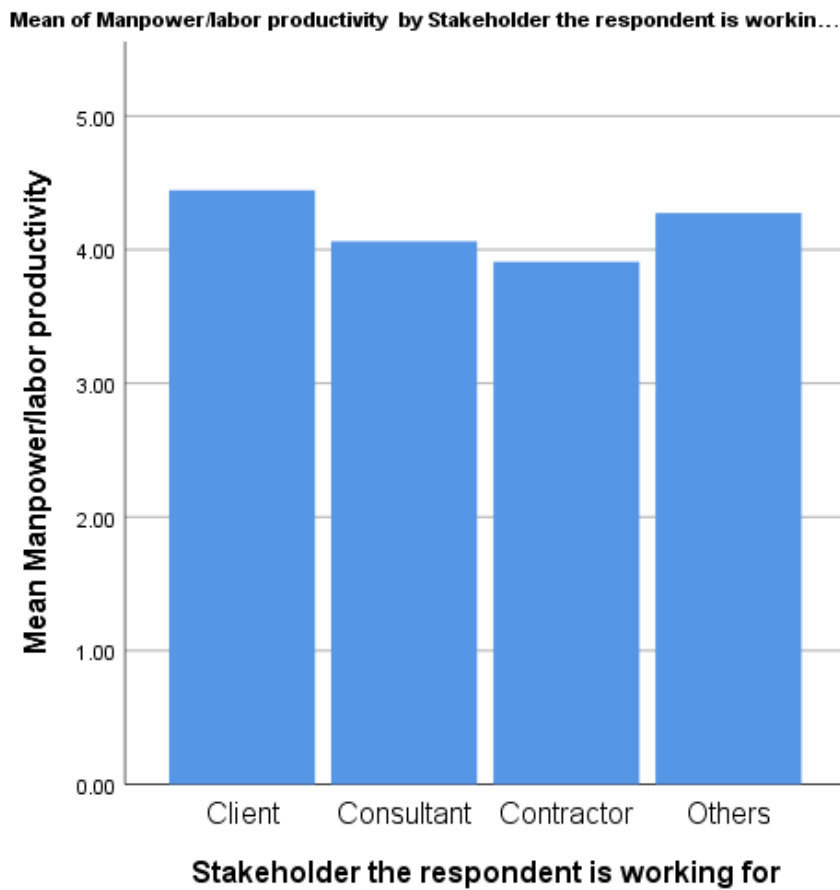


Figure 12 - Responses towards manpower/labor productivity against the stakeholder respondents are working for

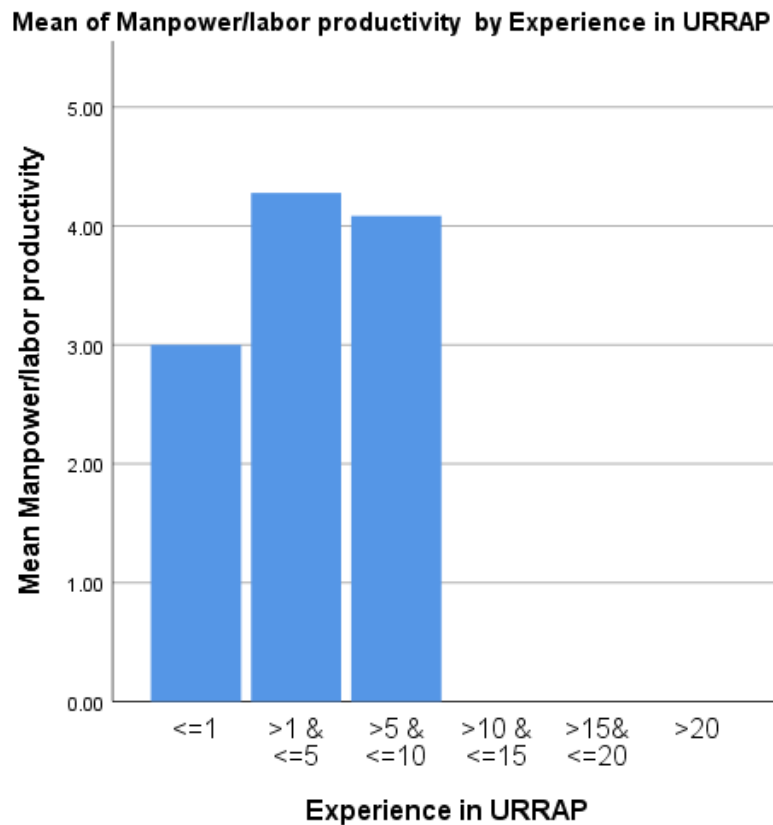


Figure 13 - Responses towards manpower/labor productivity against experience of respondents in URRAP

#### 4.3.2 Critical success factors affecting the construction of rural road under URRAP in Wolaita Zone with their respective category

As discussed in chapter three, ninety-four success factors are collected from different sources and ranked by respondents based on the degree of their effect on construction of URRAP in Wolaita Zone. These ninety-four success factors are categorized under client related success factors, consultant related success factors, contractor related success factors, project related success factors and external environment related success factors based on focus group discussion results.

Accordingly, 12, 18, 32, 9, and 23 success factors are categorized under client related, consultant (engineer) related, contractor related, project related and external environment related factors. Their detail is shown in appendix 2.

Top twenty success factors which are critical for performance of URRAP in Wolaita Zone, mainly five of them are briefly discussed in section 4.3.1 above. These discussions primarily focused on the ranking of success factors based on their degree of effect without attachment to any of five categories. But in this section top twenty critical success factors are discussed with their respective categories.

Surprisingly, there is no CSFs from both project related and external environment related CSFs with in top twenty. Terrain of the route of the project is CSF related with project, and is ranked 73<sup>rd</sup> with mean score of responses of 2.78 and RII of 55.64%. The highest CSFs from external environment related CSFs is profit margin of the program with rank of 26<sup>th</sup> by scoring 3.46 mean of responses and 69.74 of RII. Thus, discussions in the next sections focus on top twenty CSFs only which are grouped under the first three categories. The following table shows top twenty CSFs with their respective category.

Table 26 - top twenty critical success factors (CSFs) with their category

Rank	Critical success factors (CSFs)	Mean rank	RII	Category
1	Financial capacity of client /Timely payments	4.32	86.41	Client related
2	Timely delivery of design, specification and related documents	4.21	84.10	Consultant related
3	Availability of liquid asset and/or cash flow management	4.19	83.85	Contractor related
4	Effective project team formation, commitment and motivation of the team	4.17	83.33	Contractor related
5	Manpower/labor productivity	4.12	82.31	Contractor related
6	Technical capacity of contractor	4.04	80.77	Contractor related
7	The time taken for scope change, design and specification approval	4.03	80.51	Client related
8	Commitment of consultant to meet project objectives	3.99	79.74	Consultant related
9	Effective project contract management system	3.92	78.46	Contractor related
10	Repeated change of design during construction	3.88	77.69	Consultant related
11	Ability of contractor for having detailed project planning/estimations and scheduling	3.78	75.64	Contractor related
12	Design errors/mistakes and discrepancies	3.78	75.64	Consultant related
13	Change control, risk identification and management effectiveness of consultant	3.77	75.38	Consultant related
14	Project monitoring/progress meetings	3.74	74.87	Client related
15	Availability of experienced and skillful manager/team leader	3.72	74.36	Contractor related
16	Clients characteristic (risk attitude, emphasis on low cost, quality, speed etc.)	3.71	74.10	Client related
17	Availability of resources as planned throughout the project	3.64	72.82	Contractor related
18	The time taken for decision making	3.59	71.79	Client related
19	Allocation of manpower on the right activity in the right time	3.59	71.79	Contractor related
20	Capability of contractor to coordinate Subcontractor	3.58	71.54	Contractor related

#### 4.3.2.1 Client related critical success factors (CSFs)

From top twenty CSFs, five (25%) are categorized under client. The mean of the responses of these five client related CSFs range from 4.32 to 3.59 and their respective RII ranges from 86.41 to 71.79 as shown in table 26 below.

Table 27 - Client related critical success factors

Rank of CSFs in Client related category	Client related Critical Success Factors (CSFs)	Mean rank	RII	Rank in top 20
1	Financial capacity of client /Timely payments	4.32	86.41	1
2	The time taken for scope change, design and specification approval	4.03	80.51	7
3	Project monitoring/progress meetings	3.74	74.87	14
4	Clients characteristic (risk attitude, emphasis on low cost, quality, speed etc.)	3.71	74.10	16
5	The time taken for decision making	3.59	71.79	18

Critical success factor which has the highest impact on the performance of rural road construction under URRAP in Wolaita Zone with mean of responses of 4.32 and relative importance index, RII of 86.41 with the first rank is financial capacity of client /timely payments, which is grouped under client related success factors. Five success factors categorized under client related are shown in the table above.

As discussed previously 85.2% of the total respondents believe that financial capacity of client/timely payments is critical for the performance of the project by scoring 4 & 5. The mean of responses from all stakeholders irrespective of the stakeholder they are working for is 4 and more for this critical success factor. Respondents from the client have agreed on criticality of this success factor by scoring 4 and 5. Therefore, for successful performance of construction of URRAP in Wolaita Zone, the client should be financially capable to release payments on reasonable time.

As discussed in the previous sections, new design or design change and related specification changes are approved by client before implementation. Respondents ranked this criterion to be the 2<sup>nd</sup> CSF within Client related CSFs and the 7<sup>th</sup> CSF from the top 20 CSFs of the program, because of the time taken by client to accomplish tasks related with design and scope change.

Project monitoring/management meetings is the 3<sup>rd</sup> within Client related CSFs and the 14<sup>th</sup> CSF from the top 20 of the program. In Ethiopia, it is common for tripartite meeting to be planned, chaired and monitored by client, though standard conditions of contract article 76 states that it needs to be conducted by request of either of the contractor or engineer. Since project monitoring/management meeting is crucial to evaluate the progress with regard to plan, to figure out problems occurred in the course of execution and to provide necessary solutions to improve the future performance, it needs due attention.

Clients characteristic (risk attitude, emphasis on low cost, quality, speed etc.) and the time taken for decision making are the 4<sup>th</sup> and 5<sup>th</sup> in Client related success factors and 16<sup>th</sup> and 18<sup>th</sup> from top 20 CSFs of the program. They have mean of responses of 3.71 and 3.59 respectively. As this mean is far more than 2.5, which is the average of the responses, they need enough attention to performance improvement of the program.

In general, as briefly discussed above CSFs shown in table 26 above are factors that can significantly affect the performance of URRAP in Wolaita Zone. They are Client related and can be managed by Client to improve the performance of URRAP in future.

#### ***4.3.2.2 Consultant (engineer) related critical success factors (CSFs)***

From top twenty CSFs, five (25%) are categorized under Consultant (Engineer) related CSFs. The mean of the responses of these five Consultant (Engineer) related CSFs range

from 4.21 to 3.77 and their respective RII ranges from 84.10 to 75.38 as shown in table 27 below.

Table 28 - Consultant related critical success factors

Rank of CSFs in Consultant (Engineer) related category	Consultant related Critical Success Factors (CSFs)	Mean rank	RII	Rank in top 20
1	Timely delivery of design, specification and related documents	4.21	84.10	2
2	Commitment of consultant to meet project objectives	3.99	79.74	8
3	Repeated change of design during construction	3.88	77.69	10
4	Design errors/mistakes and discrepancies	3.78	75.64	12
5	Change control, risk identification and management effectiveness of consultant	3.77	75.38	13

Timely delivery of design, specification and related documents is one and the 1<sup>st</sup> ranked of CSFs related with Consultant (Engineer) and it is 2<sup>nd</sup> ranked of the top twenty CSFs that influence performance of rural road constructed under URRAP in Wolaita Zone. Its' mean of responses is 4.21 and relative importance index is RII of 84.10% which is less than only by 2.31% from financial capacity of client /timely payments which is the 1<sup>st</sup> ranked and the highest CSF of the entire program.

As discussed in the previous section, 79% of the total respondents believe that timely delivery of design, specification and related documents is a factor that is critical for the success of the projects by scoring 4 & 5 for it. This because, as per the respondents there were times when site was handed over to the contractor ahead of completing detail design. Sometimes, certain portion of one project would be designed in detail before handing over the site to contractor and the design of remaining portion of the project was expected to be finished parallel with the construction of already designed portion of the projects.

The 2<sup>nd</sup> of consultant (engineer) related CSFs and 8<sup>th</sup> of top twenty CSFs is commitment of consultant to meet project objectives. This CSF has mean of responses of 3.99 and 79.74% of RII. As the consultant (engineer) is key stakeholder for the success of projects, its' commitment is mandatory. In construction of rural road under URRAP in SNNPRG including Wolaita Zone, the main obligations of consultant (Engineer) are design preparation, quantifying the volume of work, contract administration and supervision as confirmed from contract document.

If there is lack of commitment of consultant in any of the above obligations, the performance of the projects is affected. If consultant cannot be able to supervise work, the quality of the project might be endangered. That is why, commitment of consultant to meet project objectives is believed to be the second top consultant related factor.

The 3<sup>rd</sup> of consultant (engineer) related CSFs and 10<sup>th</sup> of top twenty CSFs is repeated change of design during construction. Mean of respondents is 3.88 and RII is 77.69% for this CSF. Repeated change of design reduces the confidence of contractor for application of the design, which in turn, delays the performance of the project. Repeated change of design during construction may result from lack of adequate data collection, allocation of inadequate time for design, lack of technical competency of designer or due to some other reason. Therefore, it is necessary for both consultant and client to avoid repeated design change during construction for future performance improvement of the program.

Design errors/mistakes and discrepancies and change control, risk identification and management effectiveness of consultant are 4<sup>th</sup> and 5<sup>th</sup> ranked CSFs categorized under Consultant (Engineer) related CSFs. Their mean of scores are 3.78 & 3.77 and RII are 75.64 & 75.38 respectively. Their mean score show that they can significantly affect the performance of projects. One of causes that can likely be a reason for errors/mistakes of design is allocation of inadequate time for design. As discussed in the above section,

there were times when sites were handed over to the contractor without provision of full design. Since contractor had to move to the site within allowed mobilization period, then it is the consultant who would be liable for any delay of the work resulted from the lack of design. To avoid delay of the work, consultant (engineer) should deliver design in short period of time during which there would be high degree of probability of occurrence of error/mistake in the design. Therefore, both consultant and client should work on reduction of design errors/mistakes and discrepancies and enhance risk identification and management effectiveness to improve the performance of projects.

#### **4.3.2.3 Contractor related critical success factors (CSFs)**

Fifty percent or 10 CSFs from top twenty are categorized under Contractor related CSFs. The mean of the responses of these ten contractor related CSFs range from 4.19 to 3.58 and their respective RII ranges from 83.85 to 71.54 as shown in table 28 below. The rank of the 1<sup>st</sup> CSF of contractor related CSF which is availability of liquid asset and/or cash flow management is 3<sup>rd</sup> from top twenty CSFs. But as stated above, half of top twenty CSFs are categorized under contractor related CSFs, which shows that the contractor should work up on them for future improvement of the program.

Table 29 - Contractor related critical success factors

Rank of CSFs in Contractor related category	Contractor related Critical Success Factors (CSFs)	Mean rank	RII	Rank in top 20
1	Availability of liquid asset and/or cash flow management	4.19	83.85	3
2	Effective project team formation, commitment and motivation of the team	4.17	83.33	4
3	Manpower/labor productivity	4.12	82.31	5
4	Technical capacity of contractor	4.04	80.77	6
5	Effective project contract management system	3.92	78.46	9
6	Ability of contractor for having detailed	3.78	75.64	11

Rank of CSFs in Contractor related category	Contractor related Critical Success Factors (CSFs)	Mean rank	RII	Rank in top 20
	project planning/estimations and scheduling			
7	Availability of experienced and skillful manager/team leader	3.72	74.36	15
8	Availability of resources as planned throughout the project	3.64	72.82	17
9	Allocation of manpower on the right activity in the right time	3.59	71.79	19
10	Capability of contractor to coordinate Subcontractor	3.58	71.54	20

The first three CSFs in table 28 which are availability of liquid asset and/or cash flow management, effective project team formation, commitment and motivation of the team and manpower/labor productivity are briefly discussed in the previous sections.

The 4<sup>th</sup> ranked CSFs from contractor related CSFs is technical capacity of contractor with mean score of responses is 4.04 and RII is 80.77. Its' RII shows that it has high effect in the performance of the project so that the contractor should know and work towards it for improvement of the performance. Technical capacity of contractor includes the availability of sufficient number of manpower with the required variety of profession, the availability of the equipment for execution of work, general and specific experiences in similar assignments and sometimes the availability of sufficient liquid asset.

As it was discussed above contractors who were participating in the program have no experience as an entity before they have started to participate in URRAP. This was one of problems faced during the implementation of projects. Some of contractors had weaknesses in management of manpower as well as machineries, cash flow and communication with other stakeholders. These shortfalls in the course of implementation have effect in the performance of project.

Other requirements for technical qualification and capacity of contractor is related with the availability of machineries necessary to execute the work. Some of the projects were not easy as stated during planning to be executed by labor only due to the mountainous and rolling terrain of the route, the soil type, the urgency of the projects and sometimes, the ability of contractor to manage large number of laborers distributed over distances. Therefore, equipment like dozer, grader, excavator, roller and loader are involved in construction.

But as the contractors were new to the program as an entity, none of them have either of these equipment. Rather they have given tractors assembled in Adama by Metal and Engineering Corporation (METEC) by lease. These tractors could not be able to execute any of the tasks that either of grader, dozer, excavator or roller could do. In addition, most of tractors need frequent maintenance for which technicians were not locally available. Therefore, it is the task of government to empower contractors by providing machineries that are needed for the execution of projects to improve the performance of the project by enhancing the technical capacity of contractor.

The fifth from CSFs related to contractor and the ninth from top twenty CSFs that has impact in overall performance of the program is effective project contract management system with mean score of 3.92 and RII of 78.46. As frequently stated above, contractors are new as an entity to the program, so that there is weakness in effective project management. Therefore, contractor should be able to get trainings on how to effectively manage projects.

## **CHAPTER 5      CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Introduction**

The literature review suggested that the amount of coverage of rural road is related with improvement of the life of rural population and these effect is high, especially in countries like Ethiopia as most of its' population is living in rural area. To solve problems related with lack of access and enhance the economic development of people living in rural area, the government of Ethiopia has started rural road construction by the program called Universal Rural Road Access Program, URRAP in entire Ethiopia including Wolaita Zone, and accomplished 467.95 kms of rural road in Wolaita Zone as of February, 2012 until June, 2020 as per the report of ERA.

The objectives of the study are to assess the performance of URRAP in Wolaita Zone and to identify critical success factors (CSFs) which affect the performance of it. The methods employed to attain these two objectives are briefly described in chapter three and the results of the assessment are briefly described in chapter four.

### **5.2 Conclusions**

From the findings of the research, the following conclusions can be made with regard to the performance of rural road construction under URRAP in Wolaita Zone:

1. The overall performance of rural road constructed from February, 2012 to June, 2020 under Universal Rural Road Access Program (URRAP) in Wolaita Zone is successful by scoring 1.85 out of 3. But there are some negative results which are small in relation to the gains of the project.

2. The weights adapted for criteria called, relevance, effectiveness, efficiency and sustainability, which are used to assess the performance of rural road construction under URRAP in Wolaita Zone are 0.295, 0.205, 0.235 and 0.265 respectively, which clearly shows that relevance and sustainability of projects need more attention than that of effectiveness and efficiency.
3. The performance of rural road construction under Universal Rural Road Access Program (URRAP) in Wolaita Zone is less than successful when evaluated against relevance and sustainability. But, the performance of the program is highly successful and successful respectively when evaluated against effectiveness and efficiency.
4. From top twenty Critical Success Factors (CSFs), five CSFs are grouped under Clients related CSFs, additional five CSFs are grouped under Consultant (Engineer) related CSFs and the remaining ten are grouped under Contractor related CSFs with no CSFs grouped under either of project related or external environment related. This shows that, as far as three contracting parties (Client, Consultant (Engineer) and Contractor) can be able to work towards these top twenty CSFs, the performance of projects will be enhanced.
5. From top twenty Critical Success Factors (CSFs) that affect the performance of rural road construction under URRAP in Wolaita Zone, financial capacity of client or the ability of client to issue payments on time is the first, which is Client related CSF. Timely delivery of design, specification and related documents is second, which is Consultant related CSF and availability of liquid asset and/or cash flow management is third, which is Contractor related CSF. The closeness of the difference between RII of these three CSFs shows that the weakness in working towards to their respective CSFs of either of the parties can weaken the

effect of the others effort, so that overall performance of the program will be affected.

This research has contribution to the rural road construction under URRAP in Wolaita Zone. Contribution of the research is related to performance assessment and summarized in this section. Accordingly, this research reveals that;

1. The performance of rural road construction under URRAP in Wolaita Zone is evaluated to be successful even though it has shortfall towards relevance and sustainability.
2. Four criteria used to assess project performance are adapted to the situation of rural road construction under URRAP in Wolaita Zone, so that interested body can use them to evaluate the performance in the future.
3. Critical success factors (CSFs) which are significantly affect rural road construction under URRAP in Wolaita Zone are identified to be used by the respective bodies for program execution improvement.
4. Critical success factors (CSFs) which are significantly affect rural road construction under URRAP in Wolaita Zone are grouped under Client related, Consultant (Engineer) related, Contractor related, Project related and external environment related CSFs which makes the respective parties to act responsibly towards CSFs belongs to them.

### **5.3 Recommendations**

As it is known that one of objectives of scientific research is solving problems. Hence, this research has the following recommendations depending up on the findings of it.

1. The Client (government) should ensure that all works that are necessary to ensure the relevance of project are properly performed before contract of construction is made so that limited resource will properly be utilized.
2. The Client (government) should ensure that all works that are necessary to maintain sustainability of project to secure its' service for design life without excessive maintenance cost. This is one of areas where there is great insufficiency exists and needs proper attention.
3. The Client (government) should prioritize the construction of rural roads in the region including Wolaita Zone to avoid delays resulted from the shortage of budget due to the commencement of many projects at the same time.
4. Client (government) should empower contractors participating in execution of rural road construction under URRAP by supplying them equipment's like excavator whose tasks cannot easily be replaced by manpower, either lease or any other form, so that the significant contribution of these contractors' to universal rural access will be enhanced.
5. All stakeholders involved in one or the other way in execution of rural road construction under URRAP in Wolaita Zone should work towards critical success factors (CSFs) identified by this research and belonging to each of them to improve the performance of projects in future.
6. Consultant should deliver designs and related documents to avoid delays related with the lack of these documents.
7. Contractor should train to enhance project contract management, labor, equipment and cash flow management knowledge to avoid the weakness arising from the lack of knowledge and skill.

#### **5.4 Recommendations for future studies**

Further studies recommended by this research are:

1. Study of the short term impact of rural road construction under Universal Rural Road Access Program, URRAP in Wolaita Zone
2. Studies to improve performance of Universal Rural Road Access Program, URRAP in Wolaita Zone related with relevance and sustainability.
3. Study of comparative benefit of rural road construction under Universal Rural Road Access Program, URRAP and other programs in Wolaita.

#### **5.5 Limitation of the study**

This research work is limited to the following scope.

1. Performance assessment of URRAP in Wolaita Zone is limited to output, not outcome and impact.
2. It is limited to average performance of all projects completed until June, 2020 under URRAP in Wolaita Zone, but not the performance of each project separately.

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## APPENDIX 1

### QUESTIONNAIRE 1

**Assessment of Performance and Associated Factors of Rural Road Construction in Southern Ethiopia; A Case Study of Universal Rural Road Access Program (URRAP) in Wolaita Zone**

Dear respondent, the aim of this questionnaire is to obtain necessary data for research entitled “Assessment of Performance and Associated Factors of Rural Road Construction in South Ethiopia; a Case Study of Universal Rural Road Access Program (URRAP) in Wolaita Zone” in partial fulfillment of Degree of Master of Science in Construction Technology and Management at Addis Ababa Institute of Technology, Addis Ababa University under supervision of Prof. Dr.-Ing. Abebe Dinku. The objective of the research is to assess the performance and associated factors of URRAP at Wolaita Zone. In this regard, you are kindly requested to contribute to this research work by completing this questionnaire. The identity of you and that of the company you represent shall remain confidential and all data’s found from the survey will only be used for an academic purpose. I would like to extend my appreciation for taking your precious time to respond to this questionnaire.

Dear respondent; you are given with four performance evaluation criteria, namely Relevance, Effectiveness, Efficiency and Sustainability with their definition.

You are kindly requested to assign weights for criteria which are summed up together to 100%. Definition of each criterion are written in front of each. The tool is adapted from Asian Development Bank, ADB and the bank recommends modification of the weight based on the conditions of the respective industry and situation. Accordingly, it assigns different weights from time to time for the same criteria based on specific

situation. Twenty, thirty, thirty and twenty were weights assigned for Relevance, Effectiveness, Efficiency and Sustainability by the bank in the year 2013 which later is modified to 25 for each in 2014. This can be good example for modification of weights for performance measurement criteria.

The base for the assignments of weights for each criterion mainly depends on their respective relevance to the program, the contribution they have for cost, quality and time and related parameters, ability to express the performance of URRAP and provide realistic output. You may use the behavior of construction industry in Ethiopia and specifically around URRAP, the economy of a country, the ability of user to manage the end result and any other criteria which you think necessary and influences the performance of the projects. If you have any inquiry, please contact through the following addresses.

Adnew Ayssa

Cell phone number – 09 73 11 25 95

Email – [adnewayssa@gmail.com](mailto:adnewayssa@gmail.com)

1. RELEVANCE- Relevance is the consistency of a project's impact and output with the government's development strategy, the donors lending strategy for the program, and the donors' and regions strategic objectives at the time of approval and evaluation and the adequacy of the design. It is the extent to which the objectives of a development intervention are consistent with beneficiaries' requirements, country needs, global priorities and partner' and donor's policies. By considering the above definitions, you are kindly requested to assign weight for Relevance in blank space here \_\_\_\_\_

2. **EFFECTIVENESS** - Effectiveness describes the extent to which the output is as specified in the design (planning) and monitoring framework, either as agreed at approval or as subsequently modified, has been achieved. It is the extent to which the development intervention's objectives were achieved, or are expected to be achieved, taking into account their relative importance. Also used as an aggregate measure of (or judgment about) the merit or worth of an activity, i.e. the extent to which an intervention has attained, or is expected to attain, its major relevant objectives efficiently in a sustainable fashion and with a positive institutional developmental impact. By considering the above definitions, you are kindly requested to assign weight for Relevance in blank space here
  
3. **EFFICIENCY** - Efficiency describes how economically resources have been converted to results, using the economic internal rate of return, or cost-effectiveness, of the investment or other indicators as a measure and the resilience to risk of the net benefit flows over time. By considering the above definitions, you are kindly requested to assign weight for Relevance in blank space here \_\_\_\_
  
4. **SUSTAINABILITY** - Sustainability considers the likelihood that human, institutional, financial, and other resources are sufficient to maintain the outcome over its economic life. It is about the continuation of benefits from a development intervention after major development assistance has been completed. The probability of continued long-term benefits. The resilience to risk of the net benefit flows over time. By considering the above definitions, you are kindly requested to assign weight for Relevance in blank space here \_\_\_\_\_

## QUESTIONNAIRE 2

### **Assessment of Performance and Associated Factors of Rural Road Construction in South Ethiopia; A Case Study of Universal Rural Road Access Program (URRAP) in Wolaita Zone**

Dear respondent, the aim of this questionnaire is to obtain necessary data for research entitled “Assessment of Performance and Associated Factors of Rural Road Construction in South Ethiopia; A Case Study of Universal Rural Road Access Program (URRAP) in Wolaita Zone” in partial fulfillment of Degree of Master of Science in Construction Technology and Management at Addis Ababa Institute of Technology, Addis Ababa University under supervision of Prof. Dr.-Ing. Abebe Dinku. The objective of the research is to study the performance and associated factors of URRAP at Wolaita Zone. Therefore, you are kindly requested to contribute to this research work by completing this questionnaire. The identity of you and that of the company you represent shall remain confidential and all data found from the survey will only be used for an academic purpose. I would like to extend my appreciation for taking your precious time to respond to this questionnaire. First, you are given with four performance evaluation criteria and lists of sub criteria under each of them. These performance measurement criteria and sub criteria are collected from literature and modified as per the suggestion of panel of experts to comply with the environment of rural road construction undertaken by Universal Rural Road Access Program, URRAP in Wolaita Zone. Therefore, you are kindly requested to rate each sub criteria by circling the respective numbers as follows;

- 0 Disagree
- 1 Less than agree

- 2 Agree
- 3 Strongly agree

Dear respondent, please be informed that the rate you assign 3 for a specific sub criteria will be interpreted as the performance of the project towards such sub criteria is highly relevant/highly effective/highly efficient/most likely, 2 for a specific sub criteria will be interpreted as the performance of the project towards such sub criteria is relevant/effective/efficient/likely, 1 for a specific sub criteria will be interpreted as the performance of the project towards such sub criteria is less than relevant/less than effective/less than efficient/less likely and 0 for a specific sub criteria will be interpreted as the performance of the project towards such sub criteria is irrelevant/ineffective/inefficient/ unlikely. If you have any inquiry, please do not hesitate to contact me through the following addresses.

Adnew Ayssa

Cell phone number – 09 73 11 25 95

Email – [adnewayssa@gmail.com](mailto:adnewayssa@gmail.com)

#### A. RELEVANCE

Relevance is the consistency of a project's output and outcome with the government's and donor's development strategy. It is the extent to which the objectives of a development intervention are consistent with beneficiaries' requirements, country needs, global priorities and partner' and donor's policies

1. The output and outcome of a project is consistent with government and donors long term development strategy and Millennium Development Goal, MDG

Disagree 0 1 2 3 Strongly agree

2. Sector and political economy has adequately been analyzed to establish an economic rationale for the project

Disagree 0 1 2 3 Strongly agree

3. Lessons learned about problems and opportunities from related projects are properly considered

Disagree 0 1 2 3 Strongly agree

4. Constraints for achievement of results are properly considered,

Disagree 0 1 2 3 Strongly agree

5. Timing of intervention is appropriate

Disagree 0 1 2 3 Strongly agree

6. Sufficient work has been done to make stakeholders to see the project as their own

Disagree 0 1 2 3 Strongly agree

7. Project's investment modalities are appropriate compared with available options,

Disagree 0 1 2 3 Strongly agree Strongly agree

8. Results expected from the program/projects are clearly stated

Disagree 0 1 2 3 Strongly agree

9. Alternative responses to the identified problem are properly considered,

Disagree 0 1 2 3 Strongly agree

10. Formulation/design of the program is sound so that a series of necessary and sufficient conditions being met,

Disagree 0 1 2 3 Strongly agree

11. Risk analysis is conducted adequately and in good quality to support each necessary and sufficient condition,

Disagree 0 1 2 3 Strongly agree

12. Risk mitigation measures are adequately proposed

Disagree 0 1 2 3 Strongly agree

13. Implementation arrangements are appropriate and follows sound feasibility studies

Disagree 0 1 2 3 Strongly agree

14. Service delivery arrangements and incentives are appropriate

Disagree 0 1 2 3 Strongly agree

15. Counterfactual situation (what might have happened without the project) is adequately analyzed

Disagree 0 1 2 3 Strongly agree

16. The program/projects improve the environment for the establishment and operation of private companies supporting or entering the road construction and maintenance sector

Disagree 0 1 2 3 Strongly agree

## B. EFFECTIVENESS

Effectiveness describes the extent to which the outcome, as specified in the design (planning) and monitoring framework, either as agreed at approval or as subsequently modified, has been achieved. It is the extent to which the development intervention's objectives were achieved

1. Projects are led by local administration and ensures participation of beneficiaries during route selection, planning and construction

Disagree 0 1 2 3 Strongly agree

2. The program/projects reflect and match the desires of beneficiaries at local level

Disagree 0 1 2 3 Strongly agree

3. The program/projects Integrate, recognize and complement with other Woreda and Keble infrastructure investments

Disagree 0 1 2 3 Strongly agree

4. The program/projects promotes local equipment and tools manufacturers, servicing equipment and supplying materials

Disagree 0 1 2 3 Strongly agree

5. The program/projects enhances competition in the sector and removing noncompetitive practices

Disagree 0 1 2 3 Strongly agree

6. The program/projects encourages and motivates contractors and consultants involved in the program

Disagree 0 1 2 3 Strongly agree

7. Design complies with all acceptable standards and actual site condition

Disagree 0 1 2 3 Strongly agree

8. Design is appropriate in considering range of new, innovative and appropriate water crossing technologies

Disagree 0 1 2 3 Strongly agree

9. Design is appropriate for cost effective construction and maintenance strategies

Disagree 0 1 2 3 Strongly agree

10. The cost of design is low compared with the plan

Disagree 0 1 2 3 Strongly agree

11. Supervision and contract administration is to the expected level of service

Disagree 0 1 2 3 Strongly agree

12. New design and design amendments are delivered on time

Disagree 0 1 2 3 Strongly agree

13. Design promotes efficient use of local materials and resources, including labor

Disagree 0 1 2 3 Strongly agree

14. Design encourages application of labor based, labor intensive and intermediate equipment technologies

Disagree 0 1 2 3 Strongly agree

15. Length of all-weather access road constructed or rehabilitated to a serviceable condition complies with the plan

Disagree 0 1 2 3 Strongly agree

16. The cost of construction or rehabilitation is low when compared with the planned budget,

Disagree 0 1 2 3 Strongly agree

17. The quality of finished road complies with the specification and applicable standards

Disagree 0 1 2 3 Strongly agree

18. The number of small and medium scale private enterprises participated and strengthened by the sector complies with the plan

Disagree 0 1 2 3 Strongly agree

19. The number of small and medium scale private enterprises promoted to the second level complies with the plan

Disagree 0 1 2 3 Strongly agree

20. The number of employment created for non-professionals complies with the plan

Disagree 0 1 2 3 Strongly agree

21. The number of middle level professionals participated in the program complies with the plan

Disagree 0 1 2 3 Strongly agree

22. The duration for which employment opportunity was stayed, so that the employee became beneficial complies with the plan

Disagree 0 1 2 3 Strongly agree

23. The number of skilled and unskilled laborer permanent job created for complies with plan

Disagree 0 1 2 3 Strongly agree

24. The degree of tenure of Woreda level government structure responsible for administering the roads complies with the plan

Disagree 0 1 2 3 Strongly agree

25. Sufficient number and variety of professionals are hired at Woreda level in the way that they are able to administer the roads

Disagree 0 1 2 3 Strongly agree

26. The ability of fund raising and financial allocation at Woreda level for road administration complies with the plan

Disagree 0 1 2 3 Strongly agree

27. There are low number of accidents, injuries or deaths related with the project execution compared with expectations

Disagree 0 1 2 3 Strongly agree

28. The cost of total expenditure for safety management in project is low compared with the expectations

Disagree 0 1 2 3 Strongly agree

29. Total expenditure for accident compensation, training, supervision and cost of delay due to accident is low compared with the expectation and/or plan

Disagree 0 1 2 3 Strongly agree

30. Sufficient empowerment is made to lower level institutions to take over ownership and responsibility of roads

Disagree 0 1 2 3 Strongly agree

31. Regulation of registration of small and medium sized enterprises supporting the sector is improved

Disagree 0 1 2 3 Strongly agree

32. The program has adopted sustainable rural road maintenance management strategies

Disagree 0 1 2 3 Strongly agree

33. The program has enhanced management efficiency and effectiveness of governing institutions

Disagree 0 1 2 3 Strongly agree

34. The program has introduced appropriate maintenance approaches, equipment, technologies and skilled human resources

Disagree 0 1 2 3 Strongly agree

35. The program has introduced clear reporting structures

Disagree 0 1 2 3 Strongly agree

36. The program has created regular public reporting

Disagree 0 1 2 3 Strongly agree

### C. EFFICIENCY

Efficiency describes how economically resources have been converted to results.

1. The capital invested in the construction/rehabilitation of URRAP roads is less than the investment in similar roads in other program

Disagree 0 1 2 3 Strongly agree

2. The output of the project is high compared with similar projects under another program for similar resource utilization

Disagree 0 1 2 3 Strongly agree

3. The output of the project is high compared with the plan within planned resource utilization

Disagree 0 1 2 3 Strongly agree

4. Internal rate of return, IRR of project is higher than opportunity cost of capital

Disagree 0 1 2 3 Strongly agree

5. Cost performance index of the project, which is the ratio of budgeted cost of the work performed to actual cost of work performed is greater than one

Disagree 0 1 2 3 Strongly agree

6. Schedule performance index of the project, which is the ratio of budgeted cost of the work performed to budgeted cost of work scheduled is greater than one

Disagree 0 1 2 3 Strongly agree

### D. SUSTAINABILITY

Sustainability considers the likelihood that human, institutional, financial, and other resources are sufficient to maintain the outcome over its economic life. It is about the continuation of benefits for the intended economic life from a development intervention after major development assistance has been completed

1. There are appropriate policies and procedures to ensure continued funding for operation and maintenance of both public and private enterprises

Disagree 0 1 2 3 Strongly agree

2. Policies, institutions, markets, the regulatory conditions and the risks of change are adequate to ensure the sustainability of roads

Disagree 0 1 2 3 Strongly agree

3. Government is willing to ensure its' ownership and commitment for the sustainability of roads

Disagree 0 1 2 3 Strongly agree

4. Operating or service entities are financially viable

Disagree 0 1 2 3 Strongly agree

5. Operating or service entities are capable to apply appropriate policies to ensure maintenance and availability of human resources

Disagree 0 1 2 3 Strongly agree

6. Beneficiaries or end users are profitable by using the output

Disagree 0 1 2 3 Strongly agree

7. There is adequate demand for the project output

Disagree 0 1 2 3 Strongly agree

8. The price of output is affordable to beneficiary

Disagree 0 1 2 3 Strongly agree

9. There are adequate incentives for continued stakeholder participation

Disagree 0 1 2 3 Strongly agree

10. Systems are created to maintain the environment in the implementation of the program

Disagree 0 1 2 3 Strongly agree

11. Ownership of beneficiary society at the vicinity of the project enables to ensure sustainability of the project

Disagree 0 1 2 3 Strongly agree

12. Road side is sufficiently planted to protect it from erosion

Disagree 0 1 2 3 Strongly agree

13. Regular maintenance system is created

Disagree 0 1 2 3 Strongly agree

### **QUESTIONNAIRE 3**

**Assessment of Performance and Associated Factors of Rural Road Construction in South Ethiopia; A Case Study of Universal Rural Road Access Program (URRAP) in Wolaita Zone**

Dear respondent, the aim of this questionnaire is to obtain necessary data for research entitled “Assessment of Performance and Associated Factors of Rural Road Construction in South Ethiopia; A Case Study of Universal Rural Road Access Program (URRAP) in Wolaita Zone” in partial fulfillment of Degree of Master of Science in Construction Technology and Management at Addis Ababa Institute of Technology, Addis Ababa University under supervision of Prof. Dr.-Ing. Abebe Dinku. The objective of the research is to study the performance and associated factors of URRAP at Wolaita Zone. In this regard, your contribution for the success of this thesis is inevitably high. The identity of you and that of the company you represent shall remain confidential and all data found from the survey will only be used for an academic purpose. I would like to extend my appreciation for taking your precious time to respond to this questionnaire. You are kindly requested to assign ranks for success factors by circling numbers listed five categories under them. The

Dinku. The objective of the research is to study the performance and associated factors of URRAP at Wolaita Zone. In this regard, your contribution for the success of this thesis is inevitably high. The identity of you and that of the company you represent shall remain confidential and all data found from the survey will only be used for an academic purpose. I would like to extend my appreciation for taking your precious time to respond to this questionnaire. You are kindly requested to assign ranks for success factors by circling numbers listed five categories under them. The rank you are requested to assign ranges from 1 which has very low effect to 5 with very high effect to the performance of the project. i.e.

1 Highly noncritical

2 noncritical

3 Moderately Critical

4 Critical

5 Highly Critical

In other word, the higher the value assigned to specific success factor, the higher the influence/ effect of that specific success factor to the performance of the project and vice versa. Please do not hesitate to contact me in either of the following addresses for any clarification and thank you again for you timely response.

Adnew Ayssa

Cell phone number – 09 73 11 25 95

Email – [adnewayssa@gmail.com](mailto:adnewayssa@gmail.com)

#### A. Client Related Success Factors

1. Client's experience in construction field

Highly noncritical 1 2 3 4 5 Highly critical

2. Financial capacity of client /Timely payments

Highly noncritical 1 2 3 4 5 Highly critical

3. Project monitoring/progress meetings

Highly noncritical 1 2 3 4 5 Highly critical

4. Design and material change by clients

Highly noncritical 1 2 3 4 5 Highly critical

5. Clients characteristic (risk attitude, emphasis on low cost, quality, speed etc.)

Highly noncritical 1 2 3 4 5 Highly critical

6. The clarity of terms and conditions in contract

Highly noncritical 1 2 3 4 5 Highly critical

7. Communication among project stakeholders

Highly noncritical 1 2 3 4 5 Highly critical

8. The time taken for scope change, design and specification approval

Highly noncritical 1 2 3 4 5 Highly critical

9. The time taken for decision making

Highly noncritical 1 2 3 4 5 Highly critical

10. The degree of definition or clarification of scope/goals and objectives of project

Highly noncritical 1 2 3 4 5 Highly critical

11. The adequacy of feasibility study

Highly noncritical 1 2 3 4 5 Highly critical

12. Effective management of meeting and ensuring the implementation of issues as decided by all stakeholders

Highly noncritical 1 2 3 4 5 Highly critical

## B. Consultant (Engineer) Related Success Factors

1. Consultant competence/skill/experience  
Highly noncritical 1 2 3 4 5 Highly critical
2. Design simplicity  
Highly noncritical 1 2 3 4 5 Highly critical
3. Timely delivery of design, specification and related documents  
Highly noncritical 1 2 3 4 5 Highly critical
4. Design errors/mistakes and discrepancies  
Highly noncritical 1 2 3 4 5 Highly critical
5. Design team's contribution to construction (constructability, review, value engineering, etc.)  
Highly noncritical 1 2 3 4 5 Highly critical
6. Adequacy of plans and specifications  
Highly noncritical 1 2 3 4 5 Highly critical
7. Commitment of consultant to meet project objectives  
Highly noncritical 1 2 3 4 5 Highly critical
8. Adaptability of consultant to comply with changes in project plan  
Highly noncritical 1 2 3 4 5 Highly critical
9. Effectiveness of communication systems  
Highly noncritical 1 2 3 4 5 Highly critical
10. Feedback mechanism from employer and other parties  
Highly noncritical 1 2 3 4 5 Highly critical
11. Capabilities and innovativeness of consultant's staff  
Highly noncritical 1 2 3 4 5 Highly critical

12. Effectiveness of contract administration and supervision

Highly noncritical 1 2 3 4 5 Highly critical

13. Change control, risk identification and management effectiveness of consultant

Highly noncritical 1 2 3 4 5 Highly critical

14. Follow up and ensuring implementation of effective health and safety program

Highly noncritical 1 2 3 4 5 Highly critical

15. Quality control and ensuring implementation of effective quality assurance program

Highly noncritical 1 2 3 4 5 Highly critical

16. Ability to mediate between stakeholders during dispute

Highly noncritical 1 2 3 4 5 Highly critical

17. Consultant commitment and cooperation in solving problems/quick decisions

Highly noncritical 1 2 3 4 5 Highly critical

18. Repeated change of design during construction

Highly noncritical 1 2 3 4 5 Highly critical

### C. Contractor Related Success Factors

1. Availability of liquid asset and/or cash flow management

Highly noncritical 1 2 3 4 5 Highly critical

2. Technical capacity of contractor

Highly noncritical 1 2 3 4 5 Highly critical

3. Capability of contractor to coordinate Subcontractor

Highly noncritical 1 2 3 4 5 Highly critical

4. Allocation of manpower on the right activity in the right time

Highly noncritical 1 2 3 4 5 Highly critical

5. Availability of experienced and skillful manager/team leader  
Highly noncritical 1 2 3 4 5 Highly critical
6. Effective project team formation, commitment and motivation of the team  
Highly noncritical 1 2 3 4 5 Highly critical
7. Planning, monitoring, and controlling mechanism  
Highly noncritical 1 2 3 4 5 Highly critical
8. Decision-making effectiveness of contractor  
Highly noncritical 1 2 3 4 5 Highly critical
9. Adequate communication among all project participants  
Highly noncritical 1 2 3 4 5 Highly critical
10. Effective quality assurance program  
Highly noncritical 1 2 3 4 5 Highly critical
11. Top management support and commitment to the project  
Highly noncritical 1 2 3 4 5 Highly critical
12. Availability of advanced/new technologies/ construction equipment and materials  
Highly noncritical 1 2 3 4 5 Highly critical
13. Ability of contractor for having detailed project planning/estimations and scheduling  
Highly noncritical 1 2 3 4 5 Highly critical
14. Implementing of an effective health and safety program  
Highly noncritical 1 2 3 4 5 Highly critical
15. Administration and bureaucracy in enhancing productivity  
Highly noncritical 1 2 3 4 5 Highly critical
16. Availability of resources as planned throughout the project

Highly noncritical 1 2 3 4 5 Highly critical

17. Clear and detailed procurement process and strategy

Highly noncritical 1 2 3 4 5 Highly critical

18. Effective project risk management system/process

Highly noncritical 1 2 3 4 5 Highly critical

19. Availability of experienced professionals and skillful work force/staff

Highly noncritical 1 2 3 4 5 Highly critical

20. Effective site management/control and coordination

Highly noncritical 1 2 3 4 5 Highly critical

21. Contractors experience

Highly noncritical 1 2 3 4 5 Highly critical

22. Establishing an effective document control system

Highly noncritical 1 2 3 4 5 Highly critical

23. Building trust shared by project participants

Highly noncritical 1 2 3 4 5 Highly critical

24. Manpower/labor productivity

Highly noncritical 1 2 3 4 5 Highly critical

25. Adequate career development programs

Highly noncritical 1 2 3 4 5 Highly critical

26. Adequate technological knowledge and transfer

Highly noncritical 1 2 3 4 5 Highly critical

27. Adequate training's and skill development programs

Highly noncritical 1 2 3 4 5 Highly critical

28. Clarity of roles and responsibilities among departments, teams both horizontal and vertical

Highly noncritical 1 2 3 4 5 Highly critical

29. Presence of appropriate organizational structure

Highly noncritical 1 2 3 4 5 Highly critical

30. Effective project contract management system

Highly noncritical 1 2 3 4 5 Highly critical

31. Level of usage of IT, professional software and related technologies

Highly noncritical 1 2 3 4 5 Highly critical

32. Incentives for better achievements to create competition among teams so that productivity will be enhanced

Highly noncritical 1 2 3 4 5 Highly critical

#### D. Project Related Success Factors

1. Location of project

Highly noncritical 1 2 3 4 5 Highly critical

2. Size of project

Highly noncritical 1 2 3 4 5 Highly critical

3. Uniqueness of project activities

Highly noncritical 1 2 3 4 5 Highly critical

4. Complexity of project

Highly noncritical 1 2 3 4 5 Highly critical

5. The density of project network

Highly noncritical 1 2 3 4 5 Highly critical

6. Project life cycle and urgency of outputs

Highly noncritical 1 2 3 4 5 Highly critical

7. Terrain of the route of project

Highly noncritical 1 2 3 4 5 Highly critical

8. Weather condition of area of project

Highly noncritical 1 2 3 4 5 Highly critical

9. Sub-surface condition of the project area

Highly noncritical 1 2 3 4 5 Highly critical

## E. Success Factors Related to External Environment of the Project

1. Statutory approvals by the respective government bodies

Highly noncritical 1 2 3 4 5 Highly critical

2. Availability of human and other resources in the local market

Highly noncritical 1 2 3 4 5 Highly critical

3. Government political support & political stability of the project area

Highly noncritical 1 2 3 4 5 Highly critical

4. Social/cultural environment and community involvement/support

Highly noncritical 1 2 3 4 5 Highly critical

5. Rapid change in national economy/economic change

Highly noncritical 1 2 3 4 5 Highly critical

6. High inflation rate/fluctuation of material price

Highly noncritical 1 2 3 4 5 Highly critical

7. Nature/ecological/Physical environment

Highly noncritical 1 2 3 4 5 Highly critical

8. Bribe/corruption and favoring habit in the project area

Highly noncritical 1 2 3 4 5 Highly critical

9. Stability and efficiency of government policies and legal systems to support project

Highly noncritical 1 2 3 4 5 Highly critical

10. Technological advancement/level of new technology development

Highly noncritical 1 2 3 4 5 Highly critical

11. Profit margins in the program

Highly noncritical 1 2 3 4 5 Highly critical

12. Opportunities for research & development

Highly noncritical 1 2 3 4 5 Highly critical

13. Level of participation of enterprises in industrial oriented research & development

Highly noncritical 1 2 3 4 5 Highly critical

14. Allocation of funds for research & development

Highly noncritical 1 2 3 4 5 Highly critical

15. The flexibility of the system to use innovative building materials

Highly noncritical 1 2 3 4 5 Highly critical

16. Labor turn over

Highly noncritical 1 2 3 4 5 Highly critical

17. Currently practicing government grading system of enterprises

Highly noncritical 1 2 3 4 5 Highly critical

18. Support from banking and finance sector

Highly noncritical 1 2 3 4 5 Highly critical

19. Government policy on tax

Highly noncritical 1 2 3 4 5 Highly critical

20. Government involvement in research and development

Highly noncritical 1 2 3 4 5 Highly critical

21. Availability and timely supply of utilities like electricity, water etc.

Highly noncritical 1 2 3 4 5 Highly critical

22. Ease of access and the distance traveled to equipment maintenance center/Garage

Highly noncritical 1 2 3 4 5 Highly critical

23. Ease of access and distance traveled to material testing laboratories

Highly noncritical 1 2 3 4 5 Highly critical

**APPENDIX 2**

Table 30 Minimum, maximum, mean and standard deviation of sub criteria of relevance as analyzed by SPSS

Sub criteria of relevance	N	Minimum	Maximum	Mean	Std. Deviation
The output and outcome of a project is consistent with government and donors long term development strategy and Millennium Development Goal, MDG *	78	1.00	3.00	2.57	0.52
Sector and political economy has adequately been analyzed to establish an economic rationale for the project	78	1.00	3.00	1.39	0.56
Lessons learned about problems and opportunities from related projects are properly considered	78	0.00	3.00	1.29	0.68
Constraints for achievement of results are properly considered	78	0.00	3.00	1.41	0.65
Timing of intervention is appropriate	78	1.00	3.00	1.92	0.90
Sufficient work has been done to make stakeholders to see the project as their own	78	.00	3.00	1.15	0.75
Project's investment modalities are appropriate compared with available options	78	1.00	3.00	1.61	0.64
Results expected from the program/projects are clearly stated	78	1.00	3.00	1.79	0.67
Alternative responses to the identified problem are properly considered	78	0.00	2.00	0.65	0.73
Formulation/design of the program is sound so that a series of necessary and sufficient conditions being met	78	0.00	3.00	0.78	0.78
Risk analysis is conducted adequately and in good quality to support each necessary and sufficient condition	78	0.00	3.00	0.51	0.65
Risk mitigation measures are adequately proposed	78	0.00	2.00	0.56	0.67
Implementation arrangements are appropriate and follows sound feasibility studies	78	0.00	3.00	0.92	0.78
Service delivery arrangements and incentives are appropriate	78	0.00	3.00	1.43	0.65
Counterfactual situation (what might have happened without the project) is adequately analyzed	78	0.00	2.00	1.14	0.69
The program/projects improve the environment for the establishment and operation of private companies supporting or entering the road construction and maintenance sector	78	0.00	3.00	1.50	0.65
N	78				

Table 31 Minimum, maximum, mean and standard deviation of sub criteria of Effectiveness analyzed by SPSS

Sub criteria of effectiveness	N	Minimum	Maximum	Mean	Std. Deviation
Projects are led by local administration and ensures participation of beneficiaries during route selection, planning and construction	78	1.00	3.00	2.82	0.41
The program/projects reflect and match the desires of beneficiaries at local level	78	2.00	3.00	2.98	0.11
The program/projects Integrate, recognize and complement with other Woreda and Keble infrastructure investments	78	2.00	3.00	2.97	0.15
The program/projects promotes local equipment and tools manufacturers, servicing equipment and supplying materials	78	2.00	3.00	2.73	0.44
The program/projects enhances competition in the sector and removing noncompetitive practices	78	1.00	3.00	2.65	0.55
The program/projects encourages and motivates contractors and consultants involved in the program	78	0.00	3.00	2.58	0.59
Design complies with all acceptable standards and actual site condition	78	1.00	3.00	2.64	0.60
Design is appropriate in considering range of new, innovative and appropriate water crossing technologies	78	2.00	3.00	2.89	0.30
Design is appropriate for cost effective construction and maintenance strategies	78	2.00	3.00	2.74	0.43
The cost of design is low compared with the plan	78	2.00	3.00	2.85	0.35
Supervision and contract administration is to the expected level of service	78	1.00	3.00	2.61	0.58
New design and design amendments are delivered on time	78	1.00	3.00	2.48	0.67
Design promotes efficient use of local materials and resources, including labor	78	1.00	3.00	2.92	0.31
Design encourages application of labor based, labor intensive and intermediate equipment technologies	78	2.00	3.00	2.93	0.24
Length of all-weather access road constructed or rehabilitated to a serviceable condition complies with the plan	78	2.00	3.00	2.96	0.19
The cost of construction or rehabilitation is low when compared with the planned budget	78	2.00	3.00	2.94	0.22
The quality of finished road complies with the specification and applicable standards	78	1.00	3.00	2.83	0.40

Sub criteria of effectiveness	N	Minimum	Maximum	Mean	Std. Deviation
The number of small and medium scale private enterprises participated and strengthened by the sector complies with the plan	78	2.00	3.00	2.75	0.43
The number of small and medium scale private enterprises promoted to the second level complies with the plan	78	.00	3.00	2.41	0.78
The number of employment created for non-professionals complies with the plan	78	1.00	3.00	2.80	0.45
The number of middle level professionals participated in the program complies with the plan	78	2.00	3.00	2.78	0.41
The duration for which employment opportunity was stayed, so that the employee became beneficial complies with the plan	78	1.00	3.00	2.79	0.46
The number of skilled and unskilled laborer permanent job created for complies with plan	78	1.00	5.00	2.60	0.67
The degree of tenure of Woreda level government structure responsible for administering the roads complies with the plan	78	1.00	3.00	2.47	0.57
Sufficient number and variety of professionals are hired at Woreda level in the way that they are able to administer the roads	78	1.00	3.00	2.46	0.57
The ability of fund raising and financial allocation at Woreda level for road administration complies with the plan	78	1.00	3.00	2.43	0.69
There are low number of accidents, injuries or deaths related with the project execution compared with expectations	78	2.00	3.00	2.87	0.33
The cost of total expenditure for safety management in project is low compared with the expectations	78	1.00	3.00	2.88	0.35
Total expenditure for accident compensation, training, supervision and cost of delay due to accident is low compared with the expectation and/or plan	78	1.00	3.00	2.84	0.39
Sufficient empowerment is made to lower level institutions to take over ownership and responsibility of roads	78	1.00	3.00	2.6667	0.573
Regulation of registration of small and medium sized enterprises supporting the sector is improved	78	1.00	3.00	2.69	0.49
The program has adopted sustainable rural road maintenance management strategies	78	0.00	3.00	2.42	0.76

Sub criteria of effectiveness	N	Minimum	Maximum	Mean	Std. Deviation
The program has enhanced management efficiency and effectiveness of governing institutions	78	1.00	3.00	2.71	0.50
The program has introduced appropriate maintenance approaches, equipment, technologies and skilled human resources	78	2.00	3.00	2.76	0.42
The program has introduced clear reporting structures	78	0.00	3.00	2.44	0.69
The program has created regular public reporting	78	1.00	3.00	2.50	0.55
Valid N	78				

Table 32 Minimum, maximum, mean and standard deviation of sub criteria of efficiency as analyzed by SPSS

Sub criteria of efficiency	N	Minimum	Maximum	Mean	Std. Deviation
The capital invested in the construction/rehabilitation of URRAP roads is less than the investment in similar roads in other program	78	1.00	3.00	2.67	0.54
The output of the project is high compared with similar projects under another program for similar resource utilization	78	1.00	3.00	2.62	0.56
The output of the project is high compared with the plan within planned resource utilization	78	1.00	5.00	2.60	0.67
Internal rate of return, IRR of project is higher than opportunity cost of capital	78	0.00	3.00	2.58	0.59
Cost performance index of the project, which is the ratio of budgeted cost of the work performed to actual cost of work performed is greater than one	78	1.00	3.00	2.50	0.55
Schedule performance index of the project, which is the ratio of budgeted cost of the work performed to budgeted cost of work scheduled is greater than one	78	1.00	3.00	2.48	0.65
N	78				

Table 33 - Minimum, maximum, mean and standard deviation of sub criteria of sustainability as analyzed by SPSS

Sub criteria of sustainability	N	Minimum	Maximum	Mean	Std. Deviation
There are appropriate policies and procedures to ensure continued funding for operation and maintenance of both public and private enterprises	78	0.00	1.00	0.41	0.49
Policies, institutions, markets, the regulatory conditions and the risks of change are adequate to ensure the sustainability of roads	78	0.00	2.00	0.44	0.59
Government is willing to ensure its' ownership and commitment for the sustainability of roads	78	0.00	3.00	0.98	0.56
Operating or service entities are financially viable	78	0.00	2.00	0.87	0.70
Operating or service entities are capable to apply appropriate policies to ensure maintenance and availability of human resources	78	0.00	2.00	0.43	0.57
Beneficiaries or end users are profitable by using the output	78	1.00	3.00	2.48	0.55
There is adequate demand for the project output	78	1.00	3.00	2.73	0.55
The price of output is affordable to beneficiary	78	1.00	3.00	2.65	0.62
There is adequate incentives for continued stakeholder participation	78	0.00	3.00	0.71	0.68
Systems are created to maintain the environment in the implementation of the program	78	0.00	2.00	0.88	0.53
Ownership of beneficiary society at the vicinity of the project enables to ensure sustainability of the project	78	0.00	2.00	0.83	0.67
Road side is sufficiently planted to protect it from erosion	78	0.00	2.00	1.03	0.52
Regular maintenance system is created	78	0.00	2.00	0.46	0.59
N	78				

Table 34 - Success factors and their rank

S. No.	Success factors	Minimum	Maximum	Mean	RII	Rank
1	Financial capacity of client /Timely payments	3.00	5.00	4.32	86.41	1
2	Timely delivery of design, specification and related documents	2.00	5.00	4.21	84.10	2
3	Availability of liquid asset and/or cash flow management	2.00	5.00	4.19	83.85	3
4	Effective project team formation, commitment and motivation of the team	2.00	5.00	4.17	83.33	4
5	Manpower/labor productivity	2.00	5.00	4.12	82.31	5
6	Technical capacity of contractor	2.00	5.00	4.04	80.77	6
7	The time taken for scope change, design and specification approval	2.00	5.00	4.03	80.51	7
8	Commitment of consultant to meet project objectives	2.00	5.00	3.99	79.74	8
9	Effective project contract management system	2.00	5.00	3.92	78.46	9
10	Repeated change of design during construction	2.00	5.00	3.88	77.69	10
11	Ability of contractor for having detailed project planning/estimations and scheduling	1.00	5.00	3.78	75.64	11
12	Design errors/mistakes and discrepancies	1.00	6.00	3.78	75.64	12
13	Change control, risk identification and management effectiveness of consultant	2.00	6.00	3.77	75.38	13
14	Project monitoring/progress meetings	2.00	5.00	3.74	74.87	14
15	Availability of experienced and skillful manager/team leader	1.00	5.00	3.72	74.36	15
16	Clients characteristic (risk attitude, emphasis on low cost, quality, speed etc.)	2.00	5.00	3.71	74.10	16
17	Availability of resources as planned throughout the project	2.00	5.00	3.64	72.82	17
18	The time taken for decision making	2.00	5.00	3.59	71.79	18
19	Allocation of manpower on the right activity in the right time	1.00	5.00	3.59	71.79	19
20	Capability of contractor to coordinate Subcontractor	1.00	5.00	3.58	71.54	20
21	Design simplicity	1.00	5.00	3.58	71.54	21

S. No.	Success factors	Minimum	Maximum	Mean	RII	Rank
22	Top management support and commitment to the project	2.00	5.00	3.54	70.77	22
23	Adequate career development programs	2.00	5.00	3.54	70.77	23
24	Decision-making effectiveness of contractor	1.00	5.00	3.51	70.26	24
25	Adequate communication among all project participants	2.00	5.00	3.50	70.00	25
26	Profit margins in the program	1.00	5.00	3.49	69.74	26
27	Availability of experienced professionals and skillful work force/staff	2.00	5.00	3.46	69.23	27
28	The clarity of terms and conditions in contract	1.00	5.00	3.46	69.23	28
29	Stability and efficiency of government policies, regulations, standards and legal systems to support the project	1.00	5.00	3.46	69.23	29
30	Contractors experience	1.00	5.00	3.45	68.97	30
31	Design team's contribution to construction (constructability, review, value engineering, etc.)	1.00	7.00	3.45	68.97	31
32	Effectiveness of communication systems	1.00	5.00	3.45	68.97	32
33	Presence of appropriate organizational structure	2.00	5.00	3.45	68.97	33
34	Design and material change by clients	2.00	5.00	3.44	68.72	34
35	Clarity of roles and responsibilities among departments, teams both horizontal and vertical	1.00	5.00	3.44	68.72	35
36	Adequate technological knowledge and transfer	1.00	5.00	3.44	68.72	36
37	Effectiveness of contract administration and supervision	2.00	5.00	3.42	68.46	37
38	Quality control and ensuring implementation of effective quality assurance program	1.00	5.00	3.42	68.46	38
39	Implementing of an effective health and safety program	1.00	5.00	3.41	68.21	39
40	Consultant competence/skill/experience	1.00	5.00	3.41	68.21	40
41	Effective site management/control and coordination	2.00	5.00	3.40	67.95	41

S. No.	Success factors	Minimum	Maximum	Mean	RII	Rank
42	Establishing an effective document control system	1.00	5.00	3.38	67.69	42
43	Effective quality assurance program	2.00	5.00	3.38	67.69	43
44	Consultant commitment and cooperation in solving problems/quick decisions	2.00	5.00	3.36	67.18	44
45	Communication among project stakeholders	1.00	5.00	3.35	66.92	45
46	Clear and detailed procurement process and strategy	2.00	5.00	3.32	66.41	46
47	Adequacy of plans and specifications	1.00	5.00	3.32	66.41	47
48	Adaptability of consultant to comply with changes in project plan	1.00	5.00	3.31	66.15	48
49	Support from banking and finance sector	1.00	5.00	3.31	66.15	49
50	The degree of definition or clarification of scope/goals and objectives of project	1.00	5.00	3.29	65.90	50
51	Feedback mechanism from employer and other parties	1.00	5.00	3.29	65.90	51
52	Government policy on tax	1.00	5.00	3.27	65.38	52
53	The adequacy of feasibility study	1.00	5.00	3.26	65.13	53
54	Availability of advanced/new technologies/ construction equipment and materials	1.00	5.00	3.24	64.87	54
55	Follow up and ensuring implementation of effective health and safety program	1.00	5.00	3.24	64.87	55
56	The flexibility of the system to use innovative building materials	2.00	5.00	3.23	64.62	56
57	Capabilities and innovativeness of consultant's staff	1.00	5.00	3.19	63.85	57
58	Planning, monitoring, and controlling mechanism	1.00	5.00	3.17	63.33	58
59	Effective management of meeting and ensuring the implementation of issues as decided by all stakeholders	1.00	5.00	3.15	63.08	59
60	Availability of human and other resources in the local market	1.00	5.00	3.15	63.08	60
61	Administration and bureaucracy in enhancing productivity	1.00	5.00	3.14	62.82	61
62	High inflation rate/fluctuation of material price	1.00	5.00	3.09	61.79	62
63	Building trust shared by project participants	2.00	5.00	3.08	61.54	63

S. No.	Success factors	Minimum	Maximum	Mean	RII	Rank
64	Client's experience in construction field	1.00	5.00	3.08	61.54	64
65	Effective project risk management system/process	2.00	5.00	3.03	60.51	65
66	Level of usage of IT, professional software and related technologies	1.00	5.00	3.01	60.26	66
67	Ability to mediate between stakeholders during dispute	1.00	5.00	2.96	59.23	67
68	Incentives for better achievements to create competition among teams so that productivity will be enhanced	1.00	5.00	2.95	58.97	68
69	Adequate training's and skill development programs	1.00	5.00	2.94	58.72	69
70	Currently practicing government grading system of enterprises	1.00	5.00	2.90	57.95	70
71	Nature/ecological/Physical environment	1.00	5.00	2.88	57.69	71
72	Ease of access and the distance traveled to equipment maintenance center/Garage	1.00	5.00	2.79	55.90	72
73	Terrain of the route of project	1.00	5.00	2.78	55.64	73
74	Government involvement in research and development	1.00	5.00	2.76	55.13	74
75	Ease of access and distance traveled to material testing laboratories	1.00	5.00	2.73	54.62	75
76	Weather condition of area of project	1.00	5.00	2.72	54.36	76
77	Location of project	1.00	5.00	2.67	53.33	77
78	Opportunities for research & development	1.00	5.00	2.65	53.08	78
79	Labor turn over	1.00	5.00	2.64	52.82	79
80	Level of participation of enterprises in industrial oriented research & development	1.00	5.00	2.60	52.05	80
81	Allocation of funds for research & development	1.00	5.00	2.56	51.28	81
82	Sub-surface condition of the project area	1.00	5.00	2.50	50.00	82
83	Technological advancement/level of new technology development	1.00	5.00	2.47	49.49	83
84	Project life cycle and urgency of outputs	1.00	5.00	2.42	48.46	84
85	Bribe/corruption and favoring habit in the project area	1.00	5.00	2.36	47.18	85
86	Size of project	1.00	5.00	2.33	46.67	86

S. No.	Success factors	Minimum	Maximum	Mean	RII	Rank
87	Rapid change in national economy/economic change	1.00	5.00	2.31	46.15	87
88	Availability and timely supply of utilities like electricity, water, etc.	1.00	5.00	2.22	44.36	88
89	Complexity of project	1.00	5.00	2.19	43.85	89
90	Social/cultural environment and community involvement/support	1.00	4.00	2.17	43.33	90
91	Uniqueness of project activities	1.00	5.00	2.14	42.82	91
92	The density of project network	1.00	5.00	2.13	42.56	92
93	Government political support & political stability of the project area	1.00	4.00	2.09	41.79	93
94	Statutory approvals by the respective government bodies	1.00	5.00	2.08	41.54	94
	N					