KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI, GHANA

Impact of Road Investments on the Achievement of the Millennium Development Goals: The Case of Selected Feeder Roads in Ghana

by

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DECLARATION

I hereby declare that this submission is my own work towards a Doctor of Philosophy in Planning, and that to the best of my knowledge it contains neither materials previously published by another person nor materials that have already been accepted for the award of any other degree by the University or any other university except where due acknowledgement has been made in the text.

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ABSTRACT

The objective of this study was to assess the impacts of feeder road investments on poverty reduction and the achievement of the MDGs on health and education. To achieve the objective, data were collected from four interventions (treated) and four control (untreated) corridors in four districts; two each from the Brong Ahafo and Ashanti regions. Communities along these corridors were subsequently selected and simple random sampling used to interview 985 households from the intervention (treated) with 124 households along the control (untreated) corridors. These sets of road corridors share common characteristics with the only difference between them being the treatment received, and they were used to assess the impacts the road improvement have had on their economic activities as well as their access to social services such as health and education. This is because physical inaccessibility affects school attendance, frequency of visit by supervisors and completion rate of school children. In the same manner, access to health and use of modern treatment is equally constrained, with women and children being the most affected; thus hindering the achievement of the MDGs on health and education.

The study revealed that reduction in travel time to input and output markets greatly impacted households living on the improved roads which boosted the economic participation of rural dwellers as majority are employed in agriculture. Improved corridors facilitated access to transport services which led to reduction in transport cost to input markets and technology, which in turn increased productivity and boosted crop output levels which generated significant incomes for the households.

The study further indicated that improved roads impacted positively on non-agricultural employment; specifically in the service informal sector. It was also revealed that income earned reflected in households' increased consumption, as expenditure outstripped incomes which implied the inability of households to save because they usually operated a deficit budget. The rise in consumption is a positive sign as this will help improve their nutritional level to reduce their susceptibility to illness.

The study also recorded significant reduction in travel time to access health and education facilities, particularly clinics and primary education respectively. The study further indicated that road improvements also encouraged girls' enrolment in school and women's access to non-agricultural employment.

Improvements in the road corridor also resulted in increases in average daily traffic volumes for motorized and non-motorized transport vehicles. These increases were more significant along the improved corridors than on the control corridors. In light of these findings appropriate recommendations have been presented to sustain the revealed positive impacts in the study area.

The study has contributed to the global knowledge base in rural transport with the most significant finding being the ―unintended and personal impacts of rural road investments‖. The study found that impacts of roads are seen from a personal and everyday perspective by many of the respondents. They used their own everyday life to measure the impact of the road on their life. This is a complete departure from what is known in the literature on rural transport. The study also revealed that, there was improvement in girls' enrolment at the primary level along the improved road corridor. In addition, households along the intervention corridor had better access in the form of reduced travel time to healthcare facilities; specifically clinics. The study is unclear about whether there are variations in impacts from maintaining a poorly deteriorated road and a moderately deteriorated one. This is clearly an area for further research.

The study reasserts that providing access to road is but only one aspect of addressing the access problem of rural dwellers but the mobility component remains unresolved as the provision of transport services is controlled primarily by the private sector. For rural dwellers to fully benefit from road improvements, such improvements must have sufficient, efficient and affordable transport services as well as the appropriate location of facilities to improve rural households' welfare, reduce their poverty levels and eventually lead to the realization of the MDGs. In short, rural transport investments have contributed and shown the relationship between road improvements and the achievement of the MDGs, especially in health and education, but the impacts could have been substantial had such investments been consciously mainstreamed into the design of the entire programme.

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LIST OF ACRONYMS

ADT	Average Daily Traffic
AfDB	African Development Bank
AMDD	Averting Maternal Death and Disability Program
AU	African Union
BECE	Basic Education Certificate Examination
CPI	Consumer Price Index
DAC	Development Assistance Committee
DFID	Department for International Development
EU	European Union

GDP	Gross Domestic Product
GES	Ghana Education Service
GHS	Ghana Health Service
GoG	Government of Ghana
GSS	Ghana Statistical Service
ILO	International Labour Organisation
IPEA	Institute for Applied Economic Research,
IMT	Intermediate Means of Transport
IRAP	Integrated Rural Accessibility Planning
IRTP	Integrated Approach to Rural Transport
LPG	Liquefied Petroleum Gas
LSMS	Living Standards Measurement Survey
JHS	Junior High School
KG	Kindergarten
Kg	Kilogram
MDGs	Millennium Development Goals
MoFEP	Ministry of Finance and Economic Planning
MoT	Ministry of Transport
MTDP	Medium Term Development Plan
NDPC	National Development Planning Commission
NHIS	National Health Insurance Scheme
NMT	Non-Motorised Transport
ODA	Overseas Development Assistance
OECD	Organsation for Economic Cooperation & Development
PBC	Produce Buying Company
RSDP	Road Sector Development Programme

SDGs	Sustainable Development Goals
SHS	Senior High School
SLoCaT	Sustainable Low Carbon Transport
TBA	Traditional Birth Attendant
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Scientific and Cultural Organisation
UNICEF	United Nations Children‘s Fund
WHO	World Health Organisation

CHAPTER ONE

OVERVIEW OF THE STUDY

1.1 Background to the Study

Developing countries exhibit similarities in their characteristics which is evident in their lower levels of living and productivity, lower levels of human capital, higher levels of inequality and absolute poverty, as well as higher population growth rates. Other similar characteristics include gender social fractionalisation, rapid rural-to-urban migration and urbanising poverty, lower levels of industrialisation, and underdeveloped financial markets (Mengistu, 2009; Todaro and Smith, 2009). Swee (2013) revealed that these development challenges are the results of the economic stagnation which emanated from the implementation of less productive programmes and projects under different regimes. Meng (2004) argued that Ghana‘s economic problems began with the socialist ideology pursued by the First Republic that resulted into huge debts (both external and internal) caused by the incessant borrowing. This socialist ideology with its focus on the big push theory made huge investments in all sectors of the economy but attracted low returns (Meng, 2004).

Aryeetey et al.(2000) add that, the low returns on investment started Ghana‘s economic difficulties and thus slipped from a middle income economy to a low income one. The international oil price hikes and the drought in the 1970s went further to worsen Ghana‘s economic problems (Osuji and Olowolayemo, 1998).

In the early 1980s, the development problems had fallen to their trough as shown in the worsened balance of payments and high poverty levels (ISSER, 2000). As a result, Ghana sought to reform its economy under the Structural Adjustment Programme (SAP) following the Bretton Wood‘s recommendation (Sedegah and Tuffour, 2014). The reforms were intended to achieve the goals of economic stabilisation, focussing on financial disequilibrium in the fiscal and external sectors. It was also aimed at restructuring the productive capacities with the intention of increasing efficiency and restoring growth within the medium term. With strategies such as expenditure contraction and trade liberalisation, growth of Ghana‘s Gross Domestic Product (GDP) rose from 1.3 percent to an average of 5 percent during the stabilisation period. Despite the improvement in the growth of the GDP, social problems of unemployment and high poverty still lingered on.

Additionally, Ghana‘s debt margin increased from US$1,814.4 million (43 percent of exports) in 1984 before the start of the SAP to US$5,651.4 in 1999 (ISSER, 2000). However, the economic gains resulted in severe social problems including the retrenchment strategy which was used to control the growing public expenditure. About 235, 000 jobs were lost in the public sector alone between 1985 and 1990 (Baah-Boateng, 2004).

The outcomes of the Government‘s social interventions designed to ameliorate the effects of the social cost of the adjustments were modest. For instance, by 1991/92, about 52 percent of Ghanaians were still living under the poverty line (Ghana Statistical Service, 2008). The situation improved slightly with the incidence of poverty dropping to 40% by 1998/1999. Despite the high incidence of poverty, access to health care was a privilege and not a right under the ―Cash and Carry System‖. To the National Development Planning Commission (NDPC, 2005), the ‗Cash and Carry System‘ of paying for health care at the point of service was a key financial barrier to health care access for the poor. Lin (2003) revealed that the socioeconomic challenges were not unique to Ghana but in almost all developing countries. By the year 2012/2013 the poverty situation had improved as the proportion of the population considered as poor stood at 24.2%. However, those living in extreme poverty in the same period recorded per adult equivalent per year an estimated figure of 8.4% of Ghanaians (GSS, 2012).

Following the diverse socio-economic problems afflicting developing countries, the United Nations (UN) in the year 2000 resolved to rollback the challenges confronting these countries. The resolution was aimed at guiding these countries in the design and implementation of programmes and projects to enhance the living standards of their populace. The Millennium Development Goals (MDGs) were therefore adopted as the benchmarks for the assessment of progress made by developing countries in improving the living conditions of their citizenry (Igbuzor, 2006; UNAIDS, 2011). According to the NDPC (2005), the MDGs span the critical development issues and thus provide an important subsidiary framework for assessing developing countries‘ progress towards enhancing the living conditions of their populace. Under the MDGs, the development issues which have attracted increasing attention include poverty and hunger, education, health, gender inequality in access to social and economic opportunities, and environmental degradation (NDPC, 2005; Ofori, 2010). Underpinned by the myriad of socio-economic challenges, the

World Bank (cited by NDPC, 2008) indicates that significant increases in investments are required to meet the MDG targets by 2015.

Following the declaration by the World Bank on the need for increased investments towards achieving the MDGs, national development planning frameworks in Ghana have focussed on the MDGs (NDPC, 2003; 2005; 2008). Specifically, the NDPC in its ―Long Term Development Plan‖, Ghana/Growth (and) Poverty Reduction Strategy (GPRS 1 & 2) make provisions for the reduction of extreme poverty and hunger, attainment of environmental sustainability, promotion of global partnership for development, and development of human capital through education and health to reflect the MDGs. After the GPRS I and II, the GSGDA I and II also placed much emphasis on the MDGs (NDPC, 2010; 2014). The NDPC by the development frameworks (GSGDA I & II) also aimed at reducing poverty and inequalities in women, increasing equitable access to, and participation in quality education at all levels, bridging the gender gap in access to education, improving access to quality maternal, child and adolescent health services by accelerating the implementation of the MDGs Accelerated Framework (MAF), and the attainment of environmental sustainability and developing the human capital to attain the targets of the MDGs. Thus, the MDGs are well integrated into Ghana‗s poverty reduction agenda.

Under the aegis of the national development frameworks, several development programmes have been implemented with the objective of attaining the MDGs. In the area of human capital development, the programmes and projects intended to achieve the MDGs are implemented under the NDPC‗s ―Framework for Human Capital Development‖. The specific policy objectives of the Framework are: to mobilise civil society for human capital development; to scale-up skills and employability; to expand pro-growth employment; to enhance gender equity in knowledge, skills and learning; to promote health for longevity and productivity; and to advance knowledge and skills. Thus, the human capital development investments are directed at education, employment, gender mainstreaming and health which reflect the MDGs.

Under the educational sector, the Education for All (EFA) policy was launched with the ultimate aim of achieving universal access to education. The universal access to education also implied gender equity in access to education at all levels. The specific strategies for achieving the EFA policy include the Capitation Grant and the Ghana School Feeding

Programme (GSFP). Similarly, the Affirmative Action was launched to mainstream gender into all social and economic opportunities that exist for human capital development with the intent of enhancing women‘s participation in decision making. Specifically, the number of women at all levels of decision-making is expected to be increased with the aim of bridging the gender gap and realise the gender equality goal of the UN.

The agricultural sector has also witnessed the implementation of myriad programmes and projects under the Food and Agriculture Sector Development Policy (FASDEP). The general objective is to modernise agriculture in order to increase production and productivity (NDPC, 2008). It is firmly grounded in the belief that, modernised agriculture is an answer to the socioeconomic development challenges of Ghana buttressing this with the sector‘s contribution to employment and GDP. Under the industrial sector, the Government of Ghana aims to create synergies between the agricultural, human resource and infrastructure development. Majority of the people engaged in agriculture are located in rural areas who are isolated from markets where inputs can be accessed to boost productivity and production. Therefore the provision or improvement in rural roads has the potential to relieve rural households and enable them participate in diverse economic activities as well as access services such as health and education to better their standard of living and help with attaining the MDGs.

Focussing on infrastructural development, the Government of Ghana intends to provide an efficient inter-modal transport service to complement industrial development. A synoptic review of the infrastructural development strategy of the Government of Ghana revealed that its focus is to enhance the industrial sector directly and thus the overall economy in the long run. The positive nexus existing between transport (road infrastructure) development and the MDGs is not emphasised (Grieco et al.,2009). Though, the development of the road infrastructure has a positive nexus with the MDGs, the direct link is not highlighted in the strategies designed to achieve the MDGs.

The purpose of this study is, therefore, to empirically explore the nexus between feeder roads rehabilitation and the achievement of the MDGs. The research is in response to the DFID‘s 2000 White Paper on International Development which encouraged the need for more and diversified research especially in developing countries to establish the direct link between the development of road infrastructure and the MDGs. The purpose is to assess how investment in road infrastructure can propel the achievement of the MDGs by 2015 (DFID, 2002). The objective of this study, therefore, is to contribute to the policy discourse aimed at facilitating the strategies directed at achieving the MDGs and, hopefully, the unmet goals rolled over to the Sustainable Development Goals (SDGs).

1.2 Problem Statement

Initial findings from the monitoring of progress towards the achievement of the MDGs by the NDPC revealed that, though some progress had been made, achieving the MDGs by 2015 was unlikely and thus require additional efforts (NDPC, 2004 cited in NDPC, 2005). Since then, government has focused on removing the constraints hindering the realisation of the MDGs. However, emphasis has been on education, health, maternal and child health and HIV/AIDS. The private sector is also being supported to drive the economy‘s engine towards growth and structural transformation.

According to the DFID the slow pace at achieving the MDGs is as a result of the nonrecognition of the positive nexus between the development of roads and the MDGs. Road infrastructure has a comprehensible influence on the prompt and affordable delivery of life-sustaining services, facilitate economic growth, empower vulnerable groups, enhance local markets, and improve accessibility, speed, cost and viability of transporting goods and services (Global Transport Knowledge Partnership, 2010; The World Bank Group, 2008; Asian Development Bank, 2011). Thus, improvement in road infrastructure and services, beyond contest, has a pervasive influence on the efficiency and effectiveness of other sectors of the economy towards the achievement of the MDGs.

In contributing to this discourse on the nexus between road infrastructure and MDGs, NDPC (2003) has stated that road infrastructure is considered important to the development of emerging economies. This assertion is underpinned by two arguments. Firstly, road conditions severally limit access to prime agricultural lands; and secondly, they limit opportunities and access to input and output markets, raise costs to producers and the predominantly self-employed women in the distributive trade (NDPC, 2003).

Despite its significant influence on their achievement, the eight MDGs did not make explicit reference to the development of road infrastructure and service (Global Transport Knowledge Partnership, 2010). Road development projects were thus implemented without due recognition to the positive correlation that they could have with the achievement of the MDGs. Premised on this background, the development of the road subsector has been pre-occupied with justifying its relationship with poverty reduction and its cross-sectoral contribution to facilitating the achievement of the MDGs (Global Transport Knowledge Partnership, 2010; the World Bank Group, 2008; Vincent, 2010).

A mid-term review of progress made towards the achievement of the MDGs led to the recognition of the significant influence road infrastructure and their auxiliary services have on the achievement of the MDGs. This is evident in the 2005 declaration by African Ministers responsible for transport and infrastructure. The declaration affirmed the importance of transport infrastructure in the achievement of the MDGs (African Union, 2008). Other studies attesting to the transport importance are Bryceson et al. (2009).

What is important now is a paradigm shift from the awareness creation on the positive relationship between the development of road infrastructure and the MDGs, to a focus on the accountability of the road subsector to actually delivering the MDGs. Thus, the expositions on the roles of road infrastructure in the achievement of the MDGs should be underpinned by empirical evidence in order to better understand the relationship. The purpose of this study is to enrich the arguments on the nexus between the MDGs and road development with empirical evidence which would be realised by analysing the impact of four feeder roads (see subsection 1.5.1) within the Brong- Ahafo and Ashanti Regions implemented by the Ministry of Transportation in 2008 towards the reduction of poverty.

Two key issues that emerge from the problem statement are that, investment in road transport infrastructure and services appears to have a direct relationship with poverty/hunger reduction (hence the achievement of the MDGs). The second issue, related to the fact that impacts on the achievements of the MDGs is largely attributable to feeder roads investments to be key in the efforts towards the achievement of the MDGs.

The research will achieve this by analysing the following issues:

1. How has feeder roads investments affected extreme poverty and hunger of households along the study corridors?;

2. What is the relationship between feeder roads investments and accessibility to basic life-sustaining services including health and education?; and

3. Which factors inhibit the effective utilisation of the road corridors in enhancing living conditions of households?

1.3 Research Objectives

Emanating from the research issues, the general objective of the research is to analyse the extent to which investments in feeder roads are affecting the lives of primary stakeholders (immediate beneficiaries) towards the achievement of the MDGs. The study also identified the challenges impeding the actualisation of the full potentials of the feeder roads and made recommendations to define the way forward.

Specifically, the study will seek to achieve the following objectives:

1. To assess the impact of the feeder roads investments on the economic activities of people living within the catchments areas of the selected roads. With the economic activities serving as the major sources of livelihood, this objective would facilitate the analysis on the impact of feeder roads on the reduction of extreme poverty and hunger of direct beneficiaries of the feeder roads - MDG1;
2. To examine the impact of the feeder roads investment on accessibility (cost of travel, waiting time, speed of travel, travel time, etc) to basic life-sustaining services. This would be analysed by considering the impact of the road infrastructure on access to health, education and markets; and
3. To identify factors inhibiting the effective use of the road corridors towards improving the living conditions of the beneficiaries.

1.4 Scope of the Study

For clarity, the scope of the study has been compartmentalised into two sections, namely: geographical and contextual.

1.4.1 Geographical Scope

The study was undertaken in four districts, namely: Sekyere South and Jaman North Districts and Bekwai and Wenchi Municipalities. The specific road corridors which were used for the study are the Agona- Wiamoase, Old Drobo – Ponko .No. 1, Poano-NtinakoAdoowa and Awisa – Atuna corridors. Four control corridors were also selected within the same districts and they are: Aniatetem – Amanhyia, Kokotesua – Wiamoase, Kokosua 1 – Kokosua 2 and Nsuhunu – Atuna corridors. The location of the road corridors and communities are presented in chapter three of this study. The choice of the rehabilitated roads is justified by the availability of baseline data that were gathered prior to the rehabilitation of the roads in 2005 by Ministry of Transportation (2008). The control corridors also share similar characteristics (economic activities, climatic conditions, rainfall pattern, soil type) as the treated corridors with the only exception being the rehabilitation of the road leading to the intervention communities. The communities along the corridors were sampled and used for the study.

1.4.2 Contextual Scope

Specifically, the study assessed the impact of the feeder roads on economic activities of households, children‘s access to primary education, gender equality and empowerment, maternal and child health, access to health care and markets.

1.5 Proposed Methodology

1.5.1 Research Design

Impact study is usually undertaken through an analytical cross-sectional analysis or by some form of historical analysis but each of these approaches has certain obvious shortcomings. In the views of Barratt and Kirwan (2009), the strengths of analytical crosssectional research are: quick and easy to conduct (no long periods of follow-up), able to measure prevalence for all factors under investigation, multiple outcomes and exposures can be studied; and good for descriptive analyses and for generating hypotheses. However, it is weakened by the difficulty in interpreting identified associations; and its susceptibility to bias due to low response. To Babbie (2009), the chief advantage of the before and after research methodology lies in the isolation of experimental variables‘ impact overtime. However, its weakness, is the tendency of attributing changes that might have occurred overtime to an intervention that was made.

In view of the fact that the two impact study methodologies have inherent shortcomings, the researcher combined cross-sectional (and used experiment and control groups) and historical (before and after for both the experiment and control groups) analysis to assess the impact of the selected feeder roads on the attainment of the MDGs. The researcher used a control group of respondents similar to the sample units (heads of households, heads of institutions, traditional authorities, among others) to test the validity of the research findings and rule out the possibility of extraneous factors contesting the reliability of the research findings.

1.5.2 Key Variables of the Research and Unit of Analysis

According to Frankfort-Nachmias and Nachmias (1996), a variable is an empirical property which can take on two or more values/forms. Thus, if a property can change either in quality or quantity, it can be termed as a variable in a research. Using variables as key elements of a research problem helps to move the research from conceptual to empirical levels. Based on these, the study‘s variables include:

1. Accessibility and Mobility of households to basic life-sustaining services(health and education) to assess the impact on mortality rates;
2. Impact on economic activities (farming, vehicle operation, trading, etc) and effects on farmers turnover;
3. Transport cost (cost of passenger and freight movement); and
4. Frequency of travel to health care facilities, basic schools, periodic and daily markets will help to improve upon the inhabitants along the road corridors which will lead to the achievement of the MDGs 1, 2, 4 and 5.

The variables, indicators for their assessment, the purpose of the variables and the units of analysis are presented in Table 1.1.

Linking the road investment to the MDGs

Investment in Feeder Roads will enhance accessibility and mobility to economic activities and basic services for the rural dwellers. The improved roads will also encourage the effective operation of transport services on improved roads. This in effect will lead to reduction in transport cost and increase frequency of travel to both economic and social service which in the long run, impact on the wellbeing of the rural people (as indicated in Figure 1.1). It can also reduce poverty and eventually lead to the realisation of the MDGs, in study rural areas.

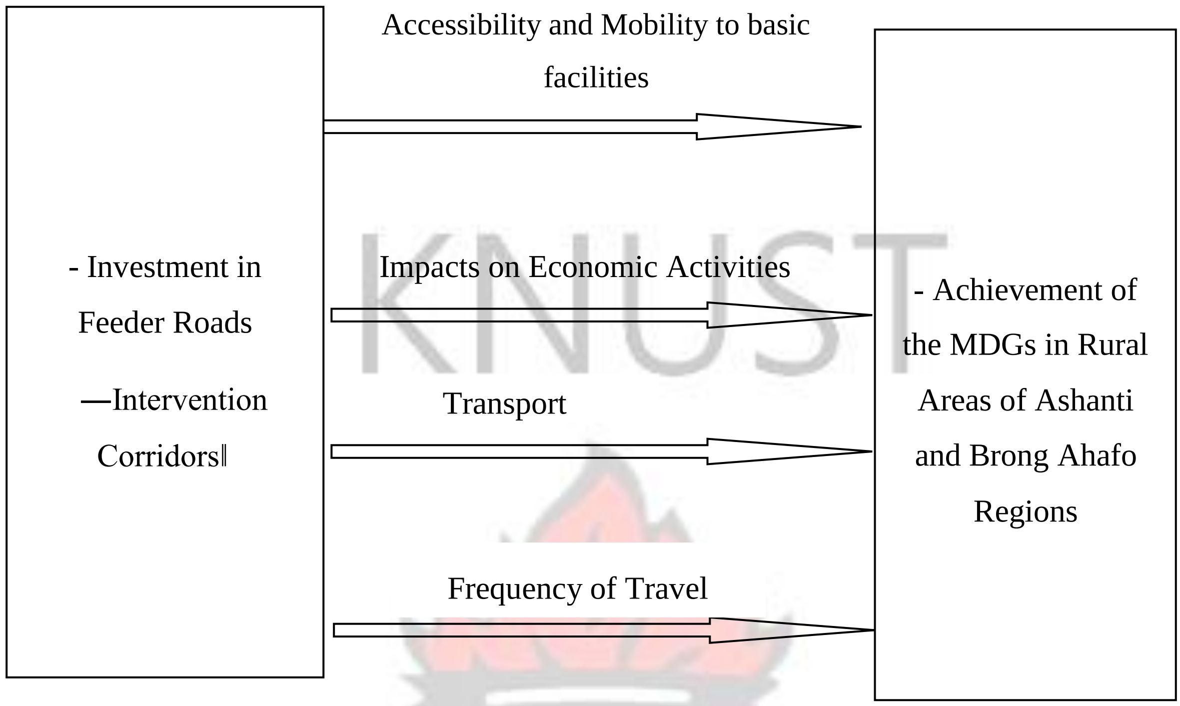


Figure 1.1: Showing the linkage of Investments to the MDGs Achievement.

Table 1.1: Study Variables and Units of Analysis

Variable	Definition/Indicators	Purpose	Units
Household characteristics	Age, sex, marital status, occupational status, educational level, income and expenditure patterns per month.	To understand who the respondents are and their major sources of livelihood which the feeder roads are expected to enhance.	Data would be collected from Household heads about the members of the households
Accessibility and Mobility	Measured in terms of time spent travelling to access basic lifesustaining commodities. Also frequency of people's (including children and women) trips to schools, health centres, etc. would be used as an indicator for the assessment of impact on mortality due to late report.	To assess the impact of the feeder roads on households' access to basic life-sustaining needs and its effects of the frequency of access to health care, education, market centres, etc.	Data would be collected from passengers, transport operators, household members, Head teachers and School management Committees of schools, Head of Institutions such as District Assemblies, Heath facilities, etc.
Impact on economic activities: 1. Farming 2. Transport/ Vehicle Operations -Vehicle operating cost 3. Trading	Output per season, post harvest losses, access to market centres, access to extension service, operations of middlemen/women, cost of transport, etc Number of trips made per day, travel time from an origin to a destination, travel speed from origin to a destination, number of passengers conveyed per trip, vehicle capacity, amount made per day, etc. -Quantity of fuel used per day, frequency of replacement of spare parts cost, tyre cost, cost and frequency of vehicle lubrication, wages of drivers and conductors, Frequency of tyre and lubricant change, etc Quantity of goods and services conveyed to market centres, frequency of commuting to market centres	Will help in determining the impact of the feeder roads on economic activities towards poverty reduction within the catchment areas of the roads. -Do- -To understand the extent to which feeder roads construction affect cost of operating vehicles in the catchment areas of the feeder roads Do-	Crop farmers, household heads, market women, vehicle operators and owners. Vehicle operators, fuel stations etc
Patterns of Travel and Transport Services	Transport cost from home to the various facilities. Fares paid for human and freight transport. Type of transport services available along the corridors	To understand whether improved feeder road conditions reduce cost of transport.	Household heads, farmers, market women, transport operators

Source: Author"s Construct, 2012.

1.5.3 Sample Frame

The sample frames are the total number of units needed for the analysis. Thus, the sample frames are the total number of households within the catchment areas (2km or 20-25 minutes walk) of the road corridors, number of farmers, number of traders and number of transport operators and so on. On average about three communities were within this radius along the intervention corridors.

1.5.4 Sampling Procedure

The study applied the multi-stage sampling procedure in selecting the units of analysis. First, the researcher purposively selected the four feeder roads because of the availability of baseline data collected by the Ministry of Transportation in 2005 before their rehabilitation. Thus, the baseline data was used as the reference points where data are available and/or comparable data on the control corridors used in assessing the impacts of the feeder roads on the attainment of the MDGs.

Following the selection of the research communities, the total number of households were determined. This was based on the formula suggested by Miller and Brewer (2003), details of which are outlined in Appendix 1.1.

Following the determination of the sample and on a prorata basis, the number of households to be selected from each study community was determined. Following this, the sample size for each community was determined and the simple random sampling procedure was applied in selecting the required households. Focus Group Discussions were held with households, women, mixed group and youth to assess the impact of the feeder roads on the living conditions of the people living within the catchment areas of the road corridors. Key informant interviews with Traditional Authorities, Assembly Members and heads of institutions such as schools and health facilities were also held.

Regarding the economic actors such as crop farmers, transport operators and traders, the researcher used accidental sampling method to select the number of economic actors who were available at the time of the survey. To triangulate the responses collected from individuals, Focus Group Discussions were further held with groups of economic actors such as farmers and transport operators. The intent was to validate the answers which were elicited from individual economic actors operating within the catchment areas of the road corridors.

The number of units sampled from the control group was selected from communities located in the same district but more than 5km from the rehabilitated road and used the simple random sampling procedure to select the units for the survey.

1.5.5 Sources of Data and Methods of Data Collection

The study used both secondary and primary sources of data to provide the required responses to the research questions. The secondary sources included both published and unpublished reports on topics related to the variables on the topic under study. The secondary sources of data provided the conceptual and theoretical frameworks which justify investments in road infrastructure as an effective poverty reduction strategy. The secondary sources of data also enabled the researcher identify information gaps and filled them with the primary data. The secondary data were collected with the aid of checklists that spelt out the relevant data required for the study.

The primary data were also collected through the researcher‘s observations and interviews that were carefully granted with respondents (household heads, economic actors, heads of institutions, traditional leaders and Assembly Members) using questionnaires and interview guides. The questionnaires, interview guides and checklists were designed around the objectives of the study. The data collection instruments were pre-tested in communities that fall under the sample frame of communities within the catchment areas of the road corridors but did not make it to the sampled communities. The intent of selecting different communities was to prevent burnout which could hamper the achievements of the research objectives.

1.5.6 Method of Data Analysis

The data collected from secondary and primary sources were both quantitative and qualitative. Editing was done with the objective of detecting and eliminating errors to ensure clean and reliable data. These data were analysed to provide answers to the research questions. The quantitative data were edited, coded and then tabulated. The responses were coded and classified into meaningful categories in order to bring out essential patterns like accessibility, mobility, income and expenditure levels of respondents to address the research issues. Data were then presented with the use of descriptive statistics. The researcher used percentage changes and other appropriate tools for the study.

Qualitative data collected and recorded from the selected communities were transcribed and categorised into various issues relevant to the study and discussed using qualitative tools such as content analysis, quotations of relevant responses and analytical references to link them to the study‘s objectives. These made it possible for the researcher to make references to statements and analytical descriptions from the respondents‘ perspectives. For example, the researcher through Focus Group Discussions (FGD) was able to analyse the qualitative data directly from the field by making statements that reflected respondents‘ views about the subject under investigation.

The reason for the combination of analytical techniques was to increase the validity of the research findings.

1.6. Limitation of the Study

The major challenge was with establishing the direct link between the study variables and the MDGs. To address this challenge, data collected from other sources such as the focus group discussions, institutions, as well as key informants interviews helped to minimise these effects through triangulation. Another limitation had to do with the possibility of _removing‘ the effects of _intervening variables‘ that will make _intervention and control‘ corridors the same except the road investments (examples of the variables include distances of communities to corridors, distances from communities to facilities, function of the communities) but this was resolved through the interactions from the focus group discussions and key informant interviews. Drawing qualitative variables from FGDs. Finally, managing FGDs such that the few _elitist‘ in the communities do not hijack the process.

1.7 Relevance of the Study

This study is relevant on two grounds. The first is that, it will support or contest discourses on the use of roads as effective strategies for the achievement of the MDGs. Thus, the research recommendations would be useful in fashioning out pro-growth policies with the aim of achieving the MDGs and other similar future projects to improve the living conditions of rural people.

The second is that, the research would serve as very useful reference point for understanding the complex dynamics of road infrastructure and poverty reduction while providing empirical basis for future policy rationale.

1.8 Organization of the Study

This report for the study is divided into six chapters. The first chapter presents the general introduction to the research work. Issues covered were the background to the study, the problem statement and research questions, research objectives and scope of the study as well as the methodology.

The second chapter is devoted to the theoretical basis and a review of relevant literature on rural transport issues, the evolution of rural transport and the current direction of rural transport research. The MDGs, goals, targets and their implementation and challenges as well as the way forward beyond the MDGs are also presented. The impacts of rural roads improvements experiences throughout the world are assessed and a conceptual framework to guide the study is also presented in this chapter.

As a preface to the analyses chapter, Chapter Three presents the methodology used for the study. This helped to collect relevant data based for the research. This chapter also assisted in collecting adequate and appropriate data from the right sources (secondary and primary).

The fourth chapter focuses on the analyses of the data collected from the field surveys. Areas covered include the background characteristics of the household heads, household size, the economic activities and incomes of household heads, the expenditure patterns of households, households access to health, education and markets. The effective use of the roads in providing access to various socioeconomic infrastructural facilities is also investigated in this chapter.

The fifth chapter summarises and discusses the major findings from the analyses chapter in Chapter Four. In addition, findings from the study are synthesized with findings from studies from elsewhere to bring out the similarities and differences in potential impacts that improved rural roads can have on poverty and achievement of the MDGs eventually.

The concluding chapter of the study, Chapter Six, presents the recommendations and conclusion to the entire study. The extent to which the study‘s objectives were achieved are also presented in this chapter. Recommendations to the major findings are also reported in addition to the study‘s contribution to knowledge and areas for further research.

CHAPTER TWO

THE PLACE OF RURAL TRANSPORT IN „GLOBAL" DEVELOPMENT EFFORTS

2.0 Introduction

After defining the research problem and objectives and placing the study in perspective in the first chapter, it is important to review and understand the role of rural transportation in rural development, the impact of transport investments on the beneficiaries and the role played by transport and non-transport interventions to alleviate poverty generally and the MDGs specifically. This is relevant because there are different views on the impact that transport interventions have on rural poor people. For example, a farmer may need a road and vehicle service to convey his goods to the nearest weekly market or to the roadside. Some labourers might want to move to the urban area or to other rural locations as farm hands to earn a living using a footpath. If the road is not in a good condition, the transport cost is bound to be high as fewer vehicles will be willing to ply such roads. These few vehicle operators tend to charge higher fares for both passengers and freight. If the users can not afford, then their utilization of the service reduces.

This section of the study is very important because, it broadens our understanding of rural transport issues and the different impacts rural or feeder transport investments have had on different locations, be it regional or local. It was surprising to find out that different locations have different impacts and that the rural transport issues are very complex and require a holistic approach to address the access problem. Better knowledge and understanding of the pertinent literature is therefore relevant, as it provides lessons on the diversity in rural transport issues and the revolution that it has seen so far from a sector based focus to a holistic approach which best addresses the rural access problem. Again, impacts of rural roads investments can better be assessed from social, economic and environmental perspective to integrate rural households into the national picture. Again, the various economic activities prevalent in the rural areas will be covered to appreciate the diversity and also understand why certain activities are predominant in specific areas.

Delving into the pertinent literature for this study would also widen and provide better understanding to assist the development of important concepts for the study. Various authors view rural transport differently, but a consensus is that, both transport and non-transport interventions‘ are necessary to reduce the access problem of rural households significantly.

Some studies have shown that improvement in rural households‘ access to the consumption of clean water and improved health following the location of water sources closer to their homes can enhance their life (Malmberg-Calvo, 1998). Others have also indicated that the introduction of Intermediate Means of Transport (IMTs) has the potential to ease the transport burden in rural areas; especially, that of rural women (Edmonds, 1998). Therefore, interventions through improvement of rural roads can reduce the time and effort spent on transport (Sieber, 1998).

The chapter is organized into sections: rural accessibility problem, the revolution of rural transport, impacts of rural transport investment, the MDGs and the relationship between transport and the MDGs including country experiences to broaden our understanding of the diverse thoughts globally to appreciate aspects which may be relevant for the Ghanaian situation. The general outline of rural transport in the developing worlde is presented to put the issue in perspective.

2.1 Overview of Rural Transport in the Global South

The objective of any transport system is to facilitate the movement of people, goods, and services from one location to another to enhance development. Improvement in transport is therefore known to reduce isolation and subsequently reduces poverty. Unfortunately, rural transport in developing countries is characterised by walking, head loading and back loading (Bryceson et al., 2002; Starkey, 2005). Other studies have shown that most rural people inhibit a walking world (Dawson & Barwell, 1993; Porter, 2002). This phenomenon is as a result of the poorly developed infrastructure, coupled with low demand for transport and over dependence on road transport. Travel here is usually within or between villages which in most cases do not require motorised transport to utilise the road infrastructure (Sieber, 1999). The section following examines the inaccessibility and mobility problems confronting the rural households.

2.2 Rural Accessibility Challenge

Poor access in rural areas poses a serious problem for rural development. This is crucial because it isolates the rural poor from their basic needs required to raise their standard of living. This trend, if not addressed, results in: low productivity, low incomes, lack of social facilities and deepens poverty levels in rural areas. Several studies have examined rural transport patterns, among them is Dennis (1998) who reviewed travel pattern in terms of the trip purpose, the factors affecting extent of travel, the load involved and the mode of transport used. This led to four categorizations, namely: subsistence, economic, improvement of human capital as well as other social and business purposes which are discussed in the next section.

2.2.1 Subsistence Needs

This covers basic activities like water collection, food and fuel collection. Although these needs are basic and important the effort used to access them is unbearable for poor households in rural settings. For example, water is transported mainly through walking and carrying, when higher quantities are needed it places a huge burden on the household concerned as this involves several trips to the water source. Studies have shown that those living close to the source are able to consume more and vice versa. For example, in Zambia those living within 5 minutes of a water source collected only 10.5 litres as compared to those living 21 minutes away who had to collect 17 litres per person. This indicates that those far away do not only travel more frequently but have to collect more water too. In Nepal more than 98% travel about 30 minutes to collect water (Central Bureau of Statistics,2004). Seasonality equally pose a problem for water collection. However, the presence of a means of transport has the potential to increase household water consumption as was the case in Uganda where the male household members' ownership of bicycles saved women indirectly from transporting water, as husbands and sons fetched the water from distant dry season sources which freed up the time for productive work (Malmberg Calvo, 1994).

Food production for household involves some travel to collect inputs such as fertilizers, preparing the land for cultivation as well as planting and harvesting. Transport is also required to move produce from farm to house and to the grinding mill. Rural households need fuel for cooking and depending on the population and vegetation of the area one could travel to a distant location to fetch firewood which is predominantly used in rural areas. A study of Tanzania, Zambia, Indonesia and the Philippines as reported by Dennis (1998) reveals that on average households consume between 10 – 20 kg of firewood per day which requires between 2 – 7 km (in one direction). The negative impact on the environment needs to be addressed by providing woodlots which is more sustainable.

2.2.2 Economic Purposes

Rural households usually produce on subsistence level but as they improve, more is produced which have to be sold. Consequently, requiring effective and efficient transport to access markets within and outside the settlement. Later in the process, production increases and more hands are needed to assist which provide employment for local people. As rural areas improve people move from agriculture into other sectors like commercial and informal services. Others also travel out to work in non-agriculture areas especially with improvement in the road. This therefore affords rural people the opportunity to participate fully if they have access to paths, tracks and roads throughout the year. For instance in Malawi people could cycle up to 60km into Blantyre for work (Dennis,1998) but in Zambia, bicycles are used for very long journeys up to 100km beyond which motorised form of transport is utilized (Starkey, 2005).

2.2.3 Transport for Development of Human Capital

People in rural areas not only access economic locations but need to access social services to make life a complete one. These services are education and health. In rural areas, school children form the greater part of those who need to access educational facilities. Unfortunately, if the facility is absent in their village they have to always walk to school. When the road is in poor condition and the distance to cover is long it affects attendance. In the area of health the absence of health facilities in close proximity to beneficiaries can be detrimental in emergency situations such as the delivery of a baby at night.

2.2.4 Transport for Social Purposes

Rural people require transport to visit family members, friends, religious obligations, funerals and out dooring. It is important to note that, as households income increases the need to travel for these events increases as well.

In summary, improvement in rural roads all things being equal, has the ability to reduce the time required to undertake subsistence activities such as fetching of water which will free up time for girls to attend school. In the same vein, rural people‘s engagement in agriculture turns to increase with improvement in transport which boost their incomes as well as encourage diversification in economic sectors of the local economy. These improvements has the potential to improve incomes to households which can be utilised in accessing facilities like health and education to improve the human capital base in the rural area as well as accessing social activities like funerals among others. These improvements will help improve the households welfare specifically and the impact on the MDGs generally and affect the total development of the rural area.

Having looked at the problems of rural transport, the next section presents an overview of rural transport.

2.3 Rural Transport in a Broader Accessibility Context

Rural transport approach is changing and a new paradigm is emerging. The provision of rural roads to be utilised by conventional motorised transport by rural dwellers to access basic facilities has not lived up to expectation. This is due mainly to the nature of rural areas which is characterised by low population density, sparse location, most travel taking place within and between villages for subsistence activities. Most of these daily activities are undertaken through walking which takes place on footpaths and trails but not on feeder roads. This, in the view of researchers,(Barwell et al., 1985;Dawson and Barwell, 1993) have not been able to propel the expected growth and development in rural communities (E.g Bryceson and Howe, 1993). This implies the access challenge remains unresolved because the conventional approach to rural transport was more sectoral but the emerging approach is integrated as it combines both transport and non-transport interventions to address the rural access challenge.

2.3.1 Traditional Approach to Rural Transport

Traditionally, the emphasis of rural transport has been on the provision of road infrastructure for motorised vehicle usage to propel economic and social development in rural communities. Some researchers have revealed the contribution of rural roads improvements to poverty reduction (Fan & Chan-Kang, 2005; Gannon & Liu, 1997). Although the infrastructure provision contributed generally to the socio-economic growth of rural communities, most individuals did not share in these benefits (Sarker & Ghosh, 2000). They noted that the conventional system depended extensively on motorised transport which does not address the range of transport needs in rural communities because majority of the households make limited use of motorised transport. The authors further state that the usage was not only expensive but also inappropriate for local basic services. Howe (1975) holds a similar view that, majority of rural people cannot afford to use motorised vehicles. In advancing this line of argument, he noted that the lack of efficient policies to develop the local transport and vehicle system are possible reasons for the crumple of the system. Hine & Riverson (2001), however, hold a divergent view on the affordability issue because they found out in their study in Ghana that the replacement of a path by a track road facilitated motorised transport usage which was cheaper than headloading the same quantity over the same distance. Beehakker et al. (1987) have revealed that the conventional system was of less relevance to the rural population due to the nature of activities which require walking mainly to execute them.

Some authors have attributed the failure of the system to the unplanned transport services which were left to the private sector to manage. For example, Howe (2001) in citing UNESCO (1967) study notes that although low-cost roads were provided to solve the rural access problem, an eurocentric view on vehicle usage was adopted making it inappropriate in a developing country context (UNESCO, 1967 cited in Howe, 2001). Another criticism levelled against the approach is the slow pace of motorization, and hence, there were limited vehicles to use the roads.

According to Donnges (2001) the approach collapsed because it was sectorial, non-participatory, and top-down, which was characteristic of urban projects and not appropriate for rural level infrastructure planning. Other studies seem to suggest that many more rural people execute their daily activities through walking on paths and trails and make less use of motorised roads (Barwell, 1993; Barwell et al, 1985; Dawson and Barwell, 1993 and Riverson & Carapetis, 1991). The above implies that the traditional approach to the access challenge remains unresolved because it was more sectoral and therefore, rural people spend more time and effort on travel related activities. Barwell and Malmberg-Calvo (1989) confirm this assertion with their study of Makete District in Tanzania where about two thirds of productive household time is spent on transport activities in and around the village. This wasted time could be made productive if the transport burden can be lessened for households especially women in rural areas to reduce their isolation and eventually alleviate poverty (World Bank, 2005; Edmonds, 1998). Although the system was helpful it was inappropriate and not affordable because rural households still walked and carried heavy loads. This implied that alternative required to address the situation; the integrated approach to rural transport was adopted.

2.3.2 Integrated Approach to Rural Transport

International Labour Office (2003) in realising around the mid-1990s that roads were not enough initiated studies in Africa and Asia to better understand the rural accessibility problem

(Dawson and Barwell, 1993). Barwell et al. (1985) presented the new approach in general and a new discipline known as the ***Integrated Rural Transport Planning (IRTP***). The initial focus of the IRTP was the identification of transport patterns and needs of rural households. The authors suggested that any intervention to address the problem should consider the following:

- The development of the road network;
- The improvement of the village level transport network (paths, tracks, and footbridges);
- Development of transport services; and
- Increase use of Intermediate Means of Transport (IMTs).

  The significant difference between the traditional approach and the integrated rural transport planning (IRTP) was the fact that the IRTP identify the transport needs and travel patterns of rural dwellers before implementation of the solution. This makes the approach participatory, bottom - up and well focused on rural level infrastructure planning which better addressed the transport related needs.

The new approach (IRTP) was first applied in Tanzania in the Makete District, under the Makete Integrated Transport Project with the objective of reducing the transport burden of rural households (Strandberg, 1993). This was because the people in the district depend on subsistence economy but their roads were in poor condition which made it difficult sending goods to the market. After the project, footpaths formerly abandoned were utilised due to improvement in the form of wooden bridges, staircases and widening of steep slopes encouraged its usage more than the feeder roads by the people to the market. Sieber (1998) reveals that the inhabitants in the Makete District enjoyed improved savings of their time, with the most significant being in water point installation which helped women a great deal to lessen their transport burden as reported by Jennings (1992). In the same district, women spent much time on travel activities to the neglect of their fields which could earn them some income. According to Sieber (1998) another benefit derived from the project was monetary as households with access to donkeys and bicycles could cultivate more and earn more than their counterparts with no access to IMTs.

Research work on rural transport continued in the later part of the 1980s where pilot projects in Africa and Asia were analysed to stretch the frontiers of rural accessibility knowledge. It is important to note that, all projects shared the same goal, but local emphasis differed between the African and Asian perspectives (ILO, 2000). The study in the Philippines focussed on decentralised access planning and capacity building whilst the Malawi project looked at the identification and implementation and pilot-testing to improve transport at the local level. These projects therefore helped to present African and Asian perspectives on the issues concerned. The studies revealed that the transport focus limits the mobility and accessibility of rural people.

This therefore implies that although the IRTP was integrated it was still transport led. It was in line with this that yet another option was sought to redress the inaccessibility problem. Donnges (2001) reveals that improved mobility and accessibility in rural communities can be realised with both transport and non-transport interventions. He further argued that the areas to be addressed are development of local infrastructure, improving transport services, enhancing IMTs and the provision of services within the communities to reduce the need to travel which is more embracing to enhance rural development.

The project focus in the early 1990s evolved and become broader as results from the studies in the Philippines and Malawi indicated that transport and non-transport interventions are the ways forward to address the access problem of rural communities. This therefore led to the birth of a new approach for rural access planning.

2.3.3 Integrated Rural Accessibility Planning (IRAP)

This is a tool used for the planning of rural access. The components of the IRAP are as follows:

- Development of the transport infrastructure;
- Rural transport services; and
- Location and quality of facilities.

The major difference between the IRTP and the IRAP is the fact that, the new approach (IRAP) is human-centred, demand-driven, multi-sectoral and participatory. It is also better than the conventional and the IRTP because it presents a better understanding of the mobility and access problem of rural communities and addresses their real needs. This is because the present approach applies both transport and non- transport means to address the mobility and access needs of rural dwellers. The holistic nature of the new approach enables rural folks derive maximum output to boost their economic and social wellbeing to enhance the achievement of the MDGs.

Lebo & Schelling (2005) explain that rural transport forms an input into the overall rural livelihood strategies, where access has three complementary elements: rural transport services, location and quality of facilities and rural transport infrastructure. The provision of the infrastructure could facilitate the location of services and boost the means of transport to better rural living. Malmberg- Calvo (1994) agrees with the holistic approach to the rural transport problem. She contends that for the transport burden on rural women to be lessened it requires the improvement of their mobility, location of facilities closer to their homes and provision of low cost infrastructure. This argument is in the right direction because most travel burden rests on women as indicated by some researchers (Jennings, 1992; World Bank, 2005; Malmberg-Calvo, 1998; and Doran, 1996). If their burden is lessened they will have more productive time to improve themselves and their households. Starkey et al. (2002) support the new rural transport paradigm and explain that access can be achieved with effective mobility and proximity of households to basic services. Starkey et al (2002) postulates that the rural transport problem requires concerted efforts and should be related to the rural livelihood pattern of rural people to make an impact on them especially in rural developing countries. They took the issue further by indicating that the actors, policies, financing and management of the three complementary components (infrastructure, transport services and location of services) need to be well addressed to achieve more for rural areas in developing countries. To the authors, the non transport approach seems viable as it meets the needs of rural poor people like the location of a grinding mill in the community, would save them time which can be spent on more productive work. The components of the IRAP are further explored.

i) Rural Transport Services

According to Porter (1997) an individual‘s mobility is achieved if s/he can move from one area to different spatial locations to access economic and social services. This, she asserts, is determined by the ability of the transport system to link the user to the various locations with the available modal options, which range from motorised vehicles like pick-up trucks and non-motorised types like animal carts. Poor communities in developing economies require improved mobility to access their crucial needs. This mobility improvement usually requires affordable, available and effective transport services for majority of the rural community to escape their poverty (Gannon & Liu 1997; Sieber, 1999; Njenga &Davis, 2003; Riverson & Carapetis, 1991; Ellis, 1997; and Starkey et al., 2002).

Starkey et al. (2002) note that, there are a range of transport services with walking at one end, intermediate means of transport in the middle and motorised means of transport at the other end. The authors however, caution that although these IMTs are usually at low cost in comparison to motorised transport may be unavailable and unaffordable to rural women due to their low incomes but who have the highest transport burden.

While some researchers argue for the use of motorized transport in rural areas, others are with the view that the range of activities in these areas cannot be satisfied wholly by motorized means but more importantly by non-motorized ones like animal carts and bicycles because of the nature of most rural activities like fetching water, firewood, which also take place within and between villages using paths and tracks, which are unsuitable for motorised means of transport (Sieber, 1999). Nyenga and Davis (2003) also reveal that rural transport services form a ‗continuum' of transport operations that connect households to the marketing and services centres, using modes such as walking, head loading, back loading, and animal carts. Additionally, Creightney (1993) found from his Tanzania study that headloading is done solely by women which accounted for more than 70% of the ton-kilometers travelled. Advancing this line of argument, Starkey et al. (2002) recommend the use of IMT for short distance travel of up to 20km and motorised means of transport for anything above 20km. The authors took the argument to another level by indicating that when demand is low intermediate transport services are appropriate but as demand increases, motorised means of transport is justified. This therefore implies that at low production, the use of non-motorised transport is economical and does not put a burden on the users (usually farmers carting their produce from the farm to the market) in terms of cost. Although rural transport services enhance personal mobility of people residing there, the challenge is still complex, because many people cannot still afford even the IMTs, according to a DFID report (Mutua et al,
2003). This therefore implies that rural transport investment programmes need to assess the importance of IMT with regard to its ownership markets, excessive taxation, regulatory restrictions as all impacts on the effective use of the infrastructure (Lebo & Schelling, 2005). The authors further assert that for transport services to be efficient and cost effective the issue of low density demand in rural locations need to be addressed. Although this is the general issue in developing rural areas, Asia unlike Africa has a wide range of IMTs to serve its rural communities. There is need for concerted effort by all stakeholders to address the problem of

financing, technological ability and the awareness of IMT services as it development can lessen the transport burden prevailing in developing countries generally and rural areas particularly.

ii) Rural Transport Infrastructure

Rural infrastructure simply refers to the footpaths, trails, tracks, footbridges, feeder roads, and any infrastructure used by rural dwellers to achieve their travel related activities. This provision coupled with transport services enhance movements within and between villages. Lebo and Schelling (2001) suggested four areas that should be considered in rural transport infrastructure:

- **Ownership** – refers to local access network which needs to be designated by legal framework to give central government ownership right with the communities. Where there is no legal framework the infrastructure is owned by the communities which maintain the inner roads and connect them to the nearest major road.
- **Managing and Financing** of rural infrastructure can be done solely by state through its local governments. In Ghana, for example, rural roads are managed by Department of Feeder Roads of the Ministry of Roads and Highway in collaboration with District Assemblies. Due to the scarcity of resources in developing countries maintenance of these roads become a challenge.
- **Traffic Characteristics-** Generally activities conducted on rural roads are mostly through walking, the use of non-motorised transport and motorised transport. The use of non-motorised transport far exceeds motorised transport and it is estimated that motorised transport can be around 50 or less vehicles per day. This therefore implies that the road is utilised minimally.
- **Physical Features** - these access areas include paths, tracks, footbridges and rural feeder roads. Again, the roads can be fully engineered or partially engineered. Partial engineered roads have side drains, cross-drainage structures, bridges, elevated above water-level driving area. They are mostly single lane or earth roads. Their purpose is to connect the various villages to the higher road network. It is recommended that RTI should be about 5km in length to enable the community manage it effectively.

It is recommended that in providing for rural communities basic access is considered, this is important because it can connect most rural households to productive activities at least cost.

Basic access is reliable, and can provide all-weather access to a host of rural people and not just concentrating on improving a single road to benefit a few individuals. Lebo & Schelling (2001) defined the term as the least cost intervention for ensuring reliable, all–-season passability for the locally available means of transport. The authors argued that in providing basic access the providers need to assess what is affordable, which could be a footbridge or improvement to an existing path or the maintenance of a motorised road by the beneficiaries of the road. Some researchers support the view that rural dwellers need to be given roads to access their basic needs (Fan & Chan-Kang, 2005; Fan, Hazell and Thorat, 1999; Fan, Zhang & Zhang, 2002). Fan and Chan-Kang (2005) further state that investments need to be utilised for low-quality roads improvement than truck roads as the benefits are far reaching and have the potential of alleviating rural poverty. Dercon et al. (2007) reveal that increasing reasonable accessibility in the wet season has a larger effect on high consumption growth. Lebo & Schelling (2001) agree that basic access is relevant but need to be reliable as well as adequate for domestic and socio-economic purposes.

Lebo & Schelling (2001) further assert that the provision of basic access to connect many rural communities is essential to achieve network equity. The authors also recommended the road to be used for motorised and non-motorised travel. In considering basic access intervention, it is important to factor the population who have access to the road. The World Bank Transport Sector Board in 2003 adopted the Rural Access Index as one of the transport headline indicators to better focus poverty reduction. This is because the Rural Access Index estimates the proportion of rural population who live within 2km or 20-25minutes walk of an all-weather road.

The index is of upmost importance because more than half the world population do not have access to motorised transport (World Bank, 2005). The report further notes that about 900 million of these people reside in developing countries and do not have access to reliable transport. This problem therefore compels households to spend considerable time on travelling to meet their socio-economic needs (World Bank, 2003; Edmonds, 1998). Advancing this argument, the increased burden placed on women because of their role in the household is acknowledged. Some criticisms have been levelled against the use of this index. Guers & van Wee (2004) asserts that person based measures like travel time between two locations is a better indicator of accessibility than distance. Roberts et al. (2006) confirm this view with their Tanzania and Albania household survey which indicated that individuals consider time spent to access a road to be a more accurate measure of accessibility than distance. Although, the measurement is problematic the World Bank acknowledges that it is the most relevant indicator for road projects in developing countries.

Again, the index use emphasizes the provision of roads for a greater number of rural folks but it fails to capture the transport services which have the potential to lessen the distance coverage. Distance coverage can have varying implications on different groups, for example a kilometre coverage by a school boy will not have the same effect on a physically disabled person. Some authors argue that the 2km coverage is not adequate on economic grounds as some people can spend more time than the estimates given by the RAI. Raballand et al. (2011) believe the coverage should be extended to 5km from an all season road, as 2km is economically not viable because the effects within that range will be limited. They suggested that a buffer zone of 5km is appropriate as most rural people particularly those in remote areas will be covered to make investment in rural roads more profitable. In this regard improving on tracks and footpaths becomes critical for farmers to be connected to utilise IMT in the absence of motorised transport beyond the 2km range used by the Bank. Another area to reduce the need to travel is the right location of basic facilities in rural communities. The section following examines this.

iii) Location and Quality of Facilities and Services

This is the third component of the IRAP. The spatial distribution of facilities and services in most rural areas in developing countries does not usually correspond to the number of people using the facility. The time spent to access these facilities depends on the location of the facility. Most rural transport researchers contend that if these basic facilities are far away from the households, women suffer greatly as they are the ones who usually take care of these activities. The World Bank (2003) confirms this position with their Tanzania study of two areas which found out that, on average, households spend between 40 to 50 hours a week on transport related activities. The report further stated that this burden heavily falls on women carrying about 80% of the total household burden. Doran (1996) holds similar view on African women and their transport burden. Malmberg-Calvo (1998) also reveals that women‘s travel and efforts are always the highest in a household. The majority of these efforts are needed for domestic subsistence activities such as collecting water, firewood, grinding mill and health care. She however notes that, with the provision of bicycles some responsibility like grinding was transferred to men to ease the burden on women in rural Uganda.

Donnges (1998) argues that in Zambia households with poorer access to a water source travel farther which was estimated to be 1439 hours to collect 35.5 tons of water. On the other hand, those with better access travel about 179 hours to collect 17.5 tons of water. This implies that those further away not only travel more but also need to collect more than their counterparts who are better off. This time and effort is viewed as unproductive which could be turned into productive time with better interventions (Edmonds, 1998). Thus the location of additional facilities in close proximity to households has the potential to improve on the accessibility of households. This above evidence therefore implies that in considering improvements to facilities, both location and the quality should be a guiding principle. Other options to address the challenge is upgrading or expanding the existing facility. It is important that the capacity of the community in dealing with the intervention is considered to make the facility sustainable. The intervention needs to be related to the policies of the country concerned as some have levels for the provision.

Table 2.1 summarises the approaches at the various stages and the different time frames.

Table 2.1: Evolution of Rural Transport

Traditional Approach before the 1990s	**Integrated Rural Transport Planning- MID 1990s**	**Integrated Rural Accessibility Planning**
Focus on conventional system (roads built for vehicles)	○ Development of road network; ○ Improvement of the village level transport network (paths, and footbridges) ○ Development of transport services ○ Increased use of intermediate Means of Transport	○ Development of transport infrastructure; ○ Rural transport services ○ Location and quality of facilities

Source: Adapted from Beehakker et al (1987); Dawson & Barwell (1993); Lebo & Schelling (2005)

2.3.4 How have the Three Approaches Shaped Rural Transport and Development

The review of the approaches of rural transport planning present a better understanding of the stages and clearly reveal the relationship that exist between transport infrastructure and services to achieve mobility to socio-economic services on one side and the rightful location of facilities to reduce the need to travel on the other side. The initial approach helped to open up the rural locations to the outside world, which facilitated growth to an extent, while the second approach also enhance both inter and intra travels with the appropriate transport services. This era though useful, as it enhanced the relationship between and among villages was still problematic due to the fact services outside the area had to be used only through long distance travels or walking. The final and present approach however, view the access issue from enhancing households mobility as well as access to facilities, which did not require motorised travel to achieve. It is hoped that more investment can be channelled to the improvement of rural roads as well as the improvement in allied facilities to bring about holistic development of rural areas. The review of the three approaches revealed that infrastructure was given the needed attention to the neglect of the services. This need to be resolved by relevant stakeholders to boost both mobility and accessibility. The impacts households derive from the investments in roads is next explored.

2.4 Road Investment Impacts

It is generally accepted that the availability of transport infrastructure (especially roads) helps to enhance the standard of living of people, especially the poor (Fan, Hazell & Thorat, 1999). This seems to suggest a positive correlation between the provision of roads and the improvement in the level of development of people, even though this correlation is not universal. In this section, the relationship between road transport investment and rural development will be explored under three sections namely social impacts, economic impacts and environmental sustainability.

2.4.1 Social Impacts of Road Investments

The contribution of rural roads to social development is mostly manifested in the provision of accessibility to major social services such as education, healthcare, sustainable energy and adequate sanitation. In fact, several studies have shown the positive relationship between road infrastructure and access to the above social services (see for examples; Coyle et al., 2009; Bryceson et al., 2008; Bhatta, 2004; Porter, 2002; and Airey, 1992).

Further to the above, Bhatta (2004) indicated that people with ―good access to roads‖ have higher educational attainment than those with poor access to road in his Ethopian study.

Moreover, the study revealed that ―improved road accessibility significantly influenced households to enrol their children in school‖. This was because lack of access hinders school attendance and flow of educational information to persuade parents to enrol their wards. It can also be said that road access facilitates the access to other educational materials such as books and furniture, especially in remote areas of the developing world.

A similar linkage between road transport investment and school attendance has been reported by a joint study of the African Union and UN Economic Commission for Africa with the collaboration of African Development Bank (AfDB), the World Bank and the European Union (EU). In a 2005 report - *Transport and the Millennium Development Goals in Africa*the group concluded that:

Transport is an important input into education for carriage of pupils, teachers and supplies. The costs, dependability and safety of transport all affect school enrolment and attendance decisions directly and, especially in rural areas, also indirectly through their effect on the quality of teachers who can be recruited and on the extent to which inspectors will monitor the schools operation. Research in the early 1990s, based on Living Standards Measurement Survey (LSMS) data for Morocco, led to the conclusion that the presence of a paved road in a community more than doubled girls school attendance rate, from 21% to 48%, whilst boys attendance rate increased from 58% to 76% (AU/ UNECA 2005: 19)

Though the report acknowledges the underlying contribution of other factors to the above, it nonetheless underscores the assertion that road transport undoubtedly helps in promoting access to schools (especially high order schools); increasing enrolment; and ensuring regularity at the primary level. This therefore implies to a large extent that, the improvement to roads have the potential of bringing about development.

Road transport promotes access in healthcare delivery, especially, in remote areas. Roads connect people in remote areas to diverse health facilities within their reach. Road transport impacts positively on health in three major areas including promoting the usage of health facilities (as opposed to other life-threatening treatment); increasing the range of services; and presenting patients with options to choose the level of (or particular) service they can access (AU/UNECA, 2005).

Maternal and infant well-being are promoted in areas with access to road infrastructure as compared to off-road residents. For instance, Porter (2002) reports that in many off-road villages in Ghana without health facilities, substantial numbers of people (particularly children) ―fail to reach hospital alive‖. Again, most off-road villages are cut off from immunisation programmes due to inaccessibility. Therefore the AU/UNECA (2005) indicated that:

the larger and more difficult part of transport‘s contribution is in bringing people to medical stations, sometimes urgently as when a few hours delay in treatment can make the difference between life and death, and more often regularly, for treatments that have to be phased and repeated on fairly rigid schedules (p. 25).

Moreover, while delay in reaching hospitals could lead to medical complications, poor access to roads also increases transport cost to health facilities. The above reveal that road infrastructure helps to increase access to distant health facilities, opens communities to health outreach programmes and lowers transport costs. Directly linked to the above is the expansion of the range of health facilities with the provision of road infrastructure. Airey (1992) indicated that the catchment area of a church hospital in the Meru District in Kenya increased with the construction of a road. He observed that the advent of the road served as an attractor for patients from far places to the facility.

However, it must be acknowledged that the above correlation between road transport and health could be simplistic given the fact that roads have adverse ramifications on health in the areas of motor accidents and air-borne infections (Thomson et al., 2008). Numerous lives have been lost through road accidents while others have sustained various degrees of injuries (see Ameratunga et al., 2006; Mohan 2008; Zimmerman et al., 2012; Sharma, 2008). Mohan (2008) has revealed that ―road traffic injuries are among the second to the sixth leading causes of death in the age groups 15-60 years in all countries around the world‖. For instance, in 2002 alone ―an estimated 1.2 million people were killed and 50 million injured in roadtraffic crashes worldwide, costing the global community about US$518 billion‖ (Ameratunga et al., 2006). It must be emphasised that these problems are protracted in low and middleincome countries where preventive and adaptive capacities are relatively limited. Aside the mortalities, pollution from vehicles are also associated with diseases such as ―asthma and chronic obstructive pulmonary disease (COPD)‖, ―acute lower respiratory tract infections and possibly tuberculosis‖ (Laumbach and Kipen, 2012). These indicate that while transport has the overall positive effect on health, particular attention should be given to addressing the issue of increasing mortalities and morbidities associated with its growth for a more beneficial outcome.

In addition to promoting access to educational and health facilities, road transport also increases access to sustainable energy such as gas Liquefied Petroleum Gas (LPG), regular waste collection and enhances access to sensitization programmes related to good sanitary practices. In all, it can be concluded that road transport has a high correlation with social enhancement and enlightenment, both prerequisites for social modernism. The positive correlation between road transport and social development should not marginalise the fact that there are adverse effects demanding preventive attention.

2.4.2 Economic Impacts of Road Investments

Microeconomic studies have revealed that investment in rural road infrastructure continually generates significant impact on agriculture, economic growth and poverty reduction. Gannon and Liu (1997) argue that investment in rural transport results in reduction in production and transaction cost which promotes trade through specialization and enhance opportunities to propel economic growth. Blocka and Webb (2001) hold a similar view and argued that, road density improvement led to specialization in intensive agriculture by farmers who had access to improved inputs. World Bank (2006) noted that rural roads are *„the first priority"* as they connect farmers to the markets for transactions. Khandker et al (2006) also support this with their study in Bangladesh where large increases in agriculture production, output prices and wages with reduction in input cost and transport cost were recorded. Dercon et al. (2007) hold a similar view, that if the major economic activity is agriculture then improvement in roads has the potential to increase productivity through reduction in cost of inputs coupled with higher output prices.

Lucas, Davis and Rikard (1996) have also shown in Tanzania, the reconstruction and rehabilitation program led to reduction in cost to both passengers and goods to access the market. Studies interested in how quality of roads impacts on different aspects of the rural community, for instance Ahmed and Hossain (1990), have revealed with their Bangladesh study that, villages with improved road accessibility recorded increases in agricultural production, through the reduction in input prices and access to technical improvements, which in turn raised their incomes as well as increase the demand for labour; the reverse was the case in the villages with poor access to the market. It is worth cautioning that increase in agricultural productivity could be as a result of temporal factors which were not controlled for in the study. Arethun and Bhatta (2012) assert that the infrastructural index applied failed to measure the actual access to service and quality as well as the extent of usage.

Other studies interested in evaluating different road types and transaction cost, is one presented by Escobal (2000) who studied two varying geographic locations in Peru with different levels of accessibility. One area was connected to the market through motorised transport while the other was linked to the same market through non-motorised transport. The author measured the transaction cost related with the marketing of potatoes and found out that the cost from the non-motorised transport was higher than those from the motorised transport.

This finding is in line with Hine and Riverson‘s (2001) study of Ghana where a village transporting the same quantity of goods by motorised vehicle over the same distance was cheaper than head loading the same produce. This finding is however at variance with Arethun & Bhatta‘s (2012) finding in their Northern Ethiopia study that in one market area in Debub prices of agricultural produce transported by motorised vehicles were higher than those by non-motorised transport (pack animal). The variation in price from the Ethiopian study was attributed to the non-inclusion of renting the pack animal and the labour in the transport cost. Conversely, the two studies from Ghana and Peru failed to explain the basis for the fares and the local conditions which could be relevant for the difference in fares charged. Again the Peru study did not indicate the distances covered from the two locations to the markets.

The labour impacts of rural road construction and improvement have been documented by several authors. Among them are Smith, Gordon, Meadow and Zwick (2001) who found that rehabilitation of roads in rural Uganda enhanced service sector employment. Lanjouw, Quizon and Sparrow (2001) share a similar view with their rehabilitated Tanzania programme where improvements on rural infrastructure enlarged non-farm opportunities. This stand by the foregoing authors seems too simplistic and it has been accordingly criticised. Barret (2001), for instance, cautions that the authors failed to estimate the profitability of the rehabilitated access to labour markets before and after the intervention to determine which was better. This notwithstanding, other researchers still consider impacts on nonfarm employment to be more prominent than those in agricultural activities (Jacoby, 2000; Hines and Riverson, 2001; Escobal and Ponce, 2002; Gachassin, Najman and Raballand, 2010). Escobal and Ponce (2002) revealed that improved roads correlated positively with nonagricultural jobs especially in self-employment and wage employment. They further indicated that the incomes earned from the economic activity could be used to access services outside the community. Lokshin and Yemtsov (2005) found in rural Georgia that rehabilitated roads enhanced off-farm opportunities and increased wage jobs for women. Gachassin, Najman and Raballand (2010) argue with empirical data from Cameroon that road investments should be at locations where there is a potential for nonfarm activities development as this has the power to reduce poverty of the area.

In terms of production, road transport serves as a channel of access to raw materials, technology and market. In the developing world where agriculture is the dominating sector in many countries, road construction and improvement leads to access to improved yields, extension services and markets (Porter, 2002; Windle and Cramb, 1997; Fan and Chan-Kang, 2008 and Bhatta, 2004). In a summary of a World Bank (1997) study of rural roads in Morocco, Levy (2004) revealed that ―higher outputs, transformation of the agricultural output mix, increased use of modern inputs specially fertilizers, improved agricultural extension services and increased amount of higher value crops such as fruits and vegetables‖. Again, AU/UNECA (2005) reports on a similar situation in Ethiopia where access to roads is one of two factors influencing the adoption of fertilisers among farmers. It was revealed that ―a farmer‗s access to an all- weather road increased the probability of fertilizer adoption by some 15-20%, depending on the region-more than any other factor‖ (AU/UNECA, 2005: 13).

Similarly, in a study by Windle and Cramb (1997) ―on economic impacts of rural roads on upland farmers in Sarawak, Malaysia‖, accessibility to market was found to be one of the two factors influencing Hill padi production. Empirical evidence also indicates that in some districts in Ghana (especially the Asante Akim South District) many farmers are unwilling to cultivate root and tuber crops due to lack of access to roads to transport these produce. Moreover, farmers in the Sekyere South District are also unable to transport produce to markets (especially in between Bepoase and Wiamoase) during the rainy season, due mainly to the poor conditions of roads (Department of Planning 2008

Roads open up access to credit facilities to farmers to help modernise agricultural practices, improve yield and expand production capacities (Porter, 2002). In Guinea, road impact studies showed that, in a period of five years, ―area sown doubled and output sold almost quadrupled in places where roads had been improved, while the same indicators stagnated in nearby areas chosen as controls because no road improvements had been undertaken‖ (AU/UNECA, 2005). Moreover, ―travel time had halved, and freight transport costs had fallen by 25% in the areas improved, but remained largely unchanged in the control areas‖ (AU/UNECA, 2005). The above underscores the significance of roads to rural economies in the Third World.

Aside boosting production, road transport promotes peripheral development. Roads open up peripheries for technology diffusion, access to economic opportunities and infrastructure, access to credit and investment. However, evidence shows that in the area of regional development, the effect of road construction and/or improvement is complex and sometimes turns out to be counter-productive.

There are numerous anecdotal studies attesting to the above position (see: Rietveld, 1994; Bryan et al., 1997; Linneker and Spence, 1996; Shriar, 2006). In a recent study of road improvements in Peten Guatemala, Shriar (2006) observed that farmers have not benefited from the road construction since prices remain the same and ―no market for new crops has emerged‖. Additionally, the farmers are facing intense competition from crops produced from other parts of the country which are being sold in Peten. The direct and modelled economic benefits of new road infrastructure are modest in comparison with the high costs and upheaval associated with the construction process‖ (Bryan et al., 1997; 235). Thus road transport provision and improvement are not unilaterally correlated with regional and peripheral development.

Despite the above rather complex relationship between road transport and peripheral development, road transport is identified as one of the factors contributing to poverty reduction. With the current insistence on labour-based construction technologies, road construction provides employment to numerous people. This ranges from construction jobs to driving. Road access also improves or increases household incomes through increasing sales, which together with access to employment in the transport and /or non-transport sectors help reduce the poverty levels. In their study in Malaysia, Windle and Cramb (1997) indicated that accessibility helps increase household incomes from farm production and off-farm employment such as wages and remittances. The authors find ―an obvious relationship between accessibility and average household income in the Padawan area‖ of Sarawak (Windle & Cramb, 1997). It was observed that the closer a household lives to a road, the higher the income of the household. This implies that those living further away from the road will have the opposite effect.

Moreover, recent studies by Fan and Chan-Kang (2008) and Warr (2010) clearly establish direct causal relationship between road construction/improvement and poverty reduction in China and Laos respectively. Fan and Chan-Kang (2008:312 – 313) postulate that:

For every 1 million yuan invested in high-grade roads, eight urban poor would be lifted above the poverty line. Low-grade roads are more beneficial to the urban poor, raising 27 urban poor above the poverty line for each million yuan invested in 2001. [....] For high-grade roads, every million yuan invested raises 13 rural poor above the official poverty. Again, low-grade roads are much more beneficial, raising 177 rural people out of poverty for every million yuan invested. For both high- and low-grade roads, the poverty impacts are largest in the southwest and northwest regions when the official poverty line is used. However, when Xian and Sheng‘s poverty line is used, the number of rural poor helped is much larger: 50 and 900 rural poor are raised above the poverty line for each million yuan invested in high and low-grade roads, respectively.

The underlying factor explaining the variability of results between low-grade roads and highgrade roads is that low-grade roads ―induce a larger increase in national food production and hence reduce food price more‖ (Fan and Chan-Kang, 2008). This implies that the road sector plays an important role in rural (and to some extent, urban) development in the Chinese socio-economy and thus coordinated road investment has a vital role in saving people from the quagmire of poverty.

The foregoing shows that in these rural areas, roads are necessary catalysts to poverty reduction and the enhancement of the economic livelihoods of large majority of people who are left behind in the _take-off‘ stage in economic development and are therefore living in the milieu of poverty. Nevertheless, with the counter-productive characteristics associated with some road investments as presented earlier on, it is imperative to coordinate road investment in such a way to reduce negative economic externalities, while simultaneously maximising the potential benefit from such investments. Suffice it to say that transport is seen as ―necessary but not sufficient for development‖ since it is (only) one of the catalytic requirements for growth and development (Leinbach, 1995) and thus concerted efforts in road transport investment should be accompanied with other efforts to bring about holistic economic development. The next section explores the environmental impacts of rural roads investments.

2.4.3 Environmental Sustainability – Negative Impacts of Road Investments

In sharp contrast with socio-economic development, road transport has a rather exploitative and destructive relationship with environmental sustainability in the areas of ecological destruction, air and noise pollution and climate change. This section presents an overview of the impact of road transport on the environment.

Road transport is a major source of disturbance to ecological well-being. Flora and fauna are lost during road construction and improvement, while these activities at the same time induce soil and land degradation. Coffin (2007) in an article titled, *From roadkill to road ecology: A review of the ecological effects of roads*, provides a comprehensive review of the effect of road transport on the ecology. Reviewing massive scholarly works interwoven with empirical evidence, she concludes that ―roads affect both the biotic and the abiotic components of landscapes by changing the dynamics of populations of plants and animals, altering flows of materials in the landscape, introducing exotic elements, and changing levels of available resources, such as water, light and nutrients‖.

Aside these direct effects, roads open up forest areas hitherto inaccessible, paving way for massive exploitation of forest resources such as logs and wild animals. For instance Adger et al. (2001) citing Brown and Lapuyade (2001) indicate that ―roads provide access and means‖ to markets for forest resources and enhances access to forest lands for agricultural purposes in Cameroon. This contributes to over exploitation leading to prolonged period of deforestation. This is a clear indication that if the ecology will be sustained amidst contemporary developmental optimism, ecologically-friendly technologies should be used in road construction and improvement.

Moreover, the relationship between road transport and atmospheric pollution has been increasingly negative, especially with the increasing ownership of automobiles in the developing world. Several studies and observations have established this fact (see for instance, Colvile et al., 2001; Demirel et al., 2008; Uherek et al., 2010; Santos et al., 2010). Air pollution has become a major negative externality of road transport for decades and the trend seems to soar as the years go by Santos et al. (2010) asserted that road transport mostly consume fossil fuels that cause emissions from ―fossil fuel combustion‖ and ―evaporation of petrol during production, storage and distribution, and evaporative emissions from the gas tank and carburettor of petrol-engined vehicles‖ with ―negative impacts at local regional and global level‖. The paper indicated that the main emissions from road transport with effects at local level are nitrogen oxides, hydrocarbons and carbon monoxide, accounting for 58%, 50% and 75% respectively of all such emissions in the European Union (EU). The problem becomes even more consequential considering the fact that road transport (as a distinguishable pollutant of air) releases emissions close to ―human receptors‖ (Colvile et al., 2001). These results in negative health and environmental repercussions as discussed earlier under social development.

Additionally, road transport has also been identified as a major cause of climate change globally since it leads to toxic emissions into the atmosphere daily. Chapman (2007) reports that road transport alone accounts for 81% of energy use in the transport sector. Subsequently, the subsector is responsible for 26% of global carbon dioxide emission and 65% of the total carbon dioxide emission in the transport sector (Chapman, 2007.). With these statistics, the contribution of the road transport sector to climate change is undeniable. Thus with increasing demand for cars in India and China and other developing countries, road transport poses a life-threatening problem to the global efforts of tackling climate change.

Moreover, road transport has been touted as a major cause of noise pollution in urban areas. This environmental nuisance brought about by road transport leads to health disorders in some urban residents. Citing the World Health Organisation (WHO), Santos et al. (2010) reported that the health of almost a third of the European population is affected by noise from road transport. The associated health disorders include:

pain and hearing fatigue, hearing impairment, annoyance, interferences with social behaviour (aggressiveness, protest and helplessness), interference with speech communication, sleep disturbance and all its consequences on a long and short term basis, cardiovascular effects, hormonal responses (stress hormones) and their possible consequences on human metabolism (nutrition) and immune system, performance at work and school.

This problem is increasingly becoming a global one since road transport has become a primary mode of transport in almost all countries in the world. There is therefore, incontestable proof that road transport has negative impact on almost all aspects of the environment. With the problem of climate change hanging on the necks of policy makers, it is important to take note of these environmental externalities associated with road transport to adopt ways of reducing emissions and at the same time reducing car use. The recent adoption of cycling and walking as alternative means of transport in some developed countries, notably the Netherlands is laudable. Policies should therefore be geared towards the implementation of these measures into transport policies for the sustainability of the earth. It is in this regard that the MDGs were evolved and hence they are subsequently reviewed.

Globally, the real and perceived impacts of (road) transport investments have been an area of a huge debate. From the literature reviewed this far, it can be submitted that transport investments – both in infrastructure and services – have had mixed impacts on rural development, poverty reduction and general improvements in local livelihoods. Again, transport investments have been key in shaping the socio-economic growth of many rural communities and regional areas. The main areas of transport impacts in rural areas, especially in developing countries, captured in literature include:

- Agriculture enhancement
- Non-agriculture employment
- Incomes and consumption
- Access to social services (education and health)

Relating the above road impacts areas to poverty reduction and the achievements of the MDGs, the literature also revealed that transport investment is a key determinant of rural poverty reduction and development but raises several environmental (and socio- economic) concerns.Having assessed the road impacts it is prudent to look at the MDGs to have a better perspective of the issues.

2.5 An Overview of the Millennium Development Goals (MDGs)

In the 1990s, various commitments were made at international conferences and summits hovering around the socio-economic and political development of the human race. These commitments are deemed to be ―innovative in that they explicitly recognise interdependence among growth, poverty reduction, and sustainable development.....‖ (Peet and Hartwick,2009). Based on these assumptions, these separate commitments were adopted as United Nations (UN) Millennium Declaration by about 190 countries in 2000 (Rigg, 2008). The declaration was a commitment to global collaborations and partnerships aimed at eradicating extreme poverty in the world through time-bound objectives collectively known as the Millennium Development Goals (MDGs). The MDGs comprises eight (8) goals with 18 targets and 48 indicators (see Appendix 2.1) to be achieved by 2015. The commitment to the achievement of these goals was reaffirmed at the 2010 High-level Plenary Meeting of the General Assembly of the United Nations on the Millennium Development Goals (UN, 2011).

It must be acknowledged that some progress towards the achievement of these targets has been made. Targets such as poverty reduction, reduction of hunger, promoting primary education, reducing child and maternal mortality, control of malaria, HIV/AIDS and tuberculosis as well as provision of clean water and sanitation are likely to be met (UN, 2011). However, this progress is not universal because of economic, gender and geographical disparities. Though gender disparities continue to be a challenge, the significant barriers remain poverty and the urban/rural divide. The poorest people have been marginalised in terms of nutrition, education, health and water and sanitation. For instance ―in sub-Saharan Africa, an urban dweller is 1.8 times more likely to use an improved drinking water source than a person living in a rural area‖ (UN, 2011.).

The total appraisal of the advancement of Ghana to achieving the various MDGs has shown a general positive performance. With reference to goals such as poverty eradication and food security, access to safe water and education, the progress has been noteworthy. Other goals such as under five infant and maternal mortalities and access to improved sanitation has shown comparatively slow progress considering the intended date; 2015 (Ghana Statistical Service, 2013).

According to Ghana Statistical Service (2013), the goal one which seeks to eradicate hunger and poverty is on course as the country is providing productive employment for all. Employment to population ratios is significantly higher in the rural areas than in the urban with 73.3% and 62.3% respectively. The rural workforce mainly operates in the private informal sector. As cited by Ghana Statistical Service (2012) and the NDPC (2010) report reveals that Ghana is making steady progress to achieving the MDG 1 by the reduction of half the nation‘s population who live in extreme poverty both in urban and rural areas. Economic growth suggests a reduction in poverty between 2006 and 2010; although there are no available data on poverty (Ghana Statistical Service, 2013). With regards to the target 3 on MDG 1, Ghana is on track in attaining two out of three child malnutrition indicators. The indicator of reducing by half the proportion who are underweight has been attained already. On the indicator of reducing the prevalence of stunting, more effort is needed to achieve the target by 2015. If the current trend persists, the target on reducing by half the prevalence of wasting may be met ahead of the target year (UNDP/NDPC/GoG, 2010).

Significant progress has been recorded on the second goal to achieve universal primary education, this is as a result of the increase in net enrolment rate for children in the age cohort 6-11 in the primary school is 74.6% as of 2010 which is an improvement of 61.4% as of year 2000. Unfortunately, the net enrolment rate for the rural areas is far lower (68.6%) than the urban which stood at 81.8% (Ghana Statistical Service, 2013). The enrolment is what is emphasized and not the quality and relevance to the socio economic development of countries concerned, as criticized by Loewe (2012).

Progress on goals 4 and 5 seem slow in meeting the target of 39.9 per 1,000 live births by the 2015 date. The situation of under-five mortality is higher in rural areas than the urban areas. Rural areas recorded 90 deaths per 1000 live births, with 83 deaths per 1000 live births for urban areas. Although steady progress is being made to achieve the target of 26 deaths per 1000 live births by 2015, the achievement of the aforementioned target is therefore questionable (Ghana Statistical Service, 2013).

Improving maternal health is goal 5. The target of 185 deaths per 100,00 live births has been set for 2015 but Ghana as at 2010, recorded 485 deaths per 100,000 live births. The highest incidence of death was recorded between 12 and 14 that is 5671 deaths per 100,000 live births (Ghana Statistical Service, 2013).

It is when the inaccessible areas are linked to national economies that the maximum returns on development investments will be realised. Hence, road transport serves as an important nexus for the achievement of the MDGs in the developing world (refer to Appendix 2.1 for road sector targets and indicators for the MDGs). Olukotun (2002) asserts that throughout the world rural transport is linked to poverty alleviation in rural areas and remains the focus of governments.

Although the MDGs present, a good guide to poverty reduction there are a number of criticisms levelled against it. The first is that the goals present a one-size fit all. This is because all countries have the same goals and targets irrespective of the national agenda for these countries.

Another criticism is that it does not address important global issues like climate change, conflicts and human rights (Braunholtz, 2007). Vandemoortele (2002) asserts that at the prevailing rate of progress all goals cannot be achieved.

According to Muiderman (2013) the MDGs were developed in a political vacuum which meant that the goals had a large degree of political support. This resulted in the execution of the MDGs around a set of largely pre-existing and narrowly defined targets which were difficulty to measure. Advancing the argument, Loewe (2012) reveals that the goals are not global goals and ultimately put obligation on the developing countries; they were generally short to medium term and thus run counter to policies that are oriented towards sustainability, which necessarily have to be inherently longer term and lastly the central areas of sustainable policies, chiefly environmental objectives, are not reflected sufficiently.

Also, some MDGs were unrealistic at the global level at the on-set; example is the MDGs- which demands total enrolment in primary education worldwide. However, some of the MDGs also demonstrated low ambitions at the global level such as the MDG 1. According to Sachs (2012), the 15-year MDG period had no intermediate milestones. He argues that 15 years is enough for policy making but establishing intermediate milestones along the way would ensure closer feedback between policies and outcomes. In addition to this, some of the MDGs measure outputs or inputs rather than outcomes or impacts of development. For example, MDG 2, measures only the enrolment in school regardless of its quality or relevance for economic, social and political life (Loewe, 2012).

This implies that the MDGs seem ambiguous and too simplistic in their approach. Another challenge was the non-inclusion of transport in the MDGs, although transport facilitates the movements of people, goods and services which would have helped the achievement of most of the goals. This is relevant because transport is essential to the socio–-economic development of locations.

In view of this, the focus of the subsequent section will be on exploring the link between transport and the MDGs briefly before examining how transport promotes the achievement of these goals by drawing on specific case studies from Lao Peoples Democratic Republic (PDR), Brazil and Ethiopia. These countries were selected because they experienced high poverty levels prior to the road implementation of projects.

2.6 Transport and the Millennium Development Goals

Transport which facilitates the mobility of people and goods was missing in the MDGs. This omission some researchers assert, delayed or prevented most of the targets of the MDGs to be achieved (Grieco et al., 2009), but half way into the implementation of the MDGs, the transport ministers in Africa raised the concern and led to the generation of targets and indicators as shown in Table 2.2. This is because transport is relevant for the realisation of all the goals. For example MDG 1 can be attained if rural people's access can be improved between the farms and markets, as this leads to reduction in input prices which will allow farmers to purchase more to boost their production. On the other hand, improved access facilitates non-farm employment and other job potentials for the rural folks (Lokshin & Yemtsov, 2005). All things being equal, these jobs will provide incomes for the people and as incomes rise there is potential for households to increase consumption. MDG 2 which is related to education, can be a challenge in rural areas if schools are at a distant location they require time, energy and money (Porter, 2002.). Rural areas record the highest dropout rate and the lowest enrolment because of distance to school, and in addition, children needed to assist during the harvesting time on the farm. Aside this, lack of access makes it difficult to recruit and sustain quality teachers in rural areas. Thus, improvement in transport facilitates children and teachers access to school on time and easy the burden placed on girls' attendance in rural areas (Bryceson, Bradbury and Bradbury, 2006). MDG 3 - Rural women are known to carry most of the household travel burden. Consequently, the provision of better, safer, affordable transport can reduce the time spent on domestic travel activities to be used in productive activities. These avenues could be in agriculture or other engagements to enable them have incomes. It increases their access to markets where foodstuffs can be sold. MDGs 4 & 5 - healthy people can work effectively to increase production. The concerns here relate primarily to children and women. Inadequate rural transport limits or restricts the usage of health facilities, especially if it is farther away from the users. Another threat is the crucial role played by skilled staff, antenatal care and obstetric care which can be compromised if the facility is not close by. Complications are bound to occur if the transport service used for the conveyance of expectant mothers to the health facility is not appropriate, available and affordable. MDG 6 Transport not only facilitates users' access to basic services but also has the ability to sustain health care in diverse ways. Disruptions in transport services affect the

timely and safe delivery of vaccines and poor access prevents patients' attendance. As personal mobility increases and transport hubs and corridors increase that becomes potential location for HIV/AIDS. Table 2.2 presents the road sector MDGs with their targets and indicators to guide the implementation and the assessment.

Table 2.2: The MDGs, and their Road sector targets and indicators

MDG	Target	Indicators
MDG 1 Eradication of extreme poverty and hunger	Access to inputs and markets, and generation of employment opportunities, improved by halving the proportion of rural population living beyond 2 km of an all-season road	Proportion of rural population within 2 km of an all season road % Reduction of travel and vehicle turnaround time % Increased productivity in agriculture and economic activities % Increase in employment opportunities and income generation from transport related activities
	The difference in average transport cost between Africa and Asia narrowed down by 50%	% Reduction in passenger fares (passenger kilometer) % Reduction in unit goods transport cost (ton kilometer) Level of affordability of transport cost by the urban and rural poor % Increase in the use of intermediate means of transport (IMT) Existence of sustainable financing mechanisms like Road Funds % Increase in the proportion of roads in good and fair condition
MDG 2 + 3 Universal primary education and gender equality	Rural access and urban mobility improved to eliminate constraints on the time which all children have to participate in education and to enable effective education to be delivered and reached safely	% of schools which have reliable access % of households which report constraints on education due to: Lack of girls time for school Difficulty (cost) of access Poor quality of education service Lack of safe access to school
MDG 4 + 5 Child Health and Maternal Mortality	Rural access and urban mobility improved for reliable supply of inputs to health facilities, to provide affordable access for all households and to enable cost effective outreach health activities	% Health centres, clinics etc with reliable rural access. % of households reporting constraints on access to health services because of: Distance Cost / difficulty of travel Poor quality health service Unit cost immunization / capita Unit cost / coverage of outreach services / capita
	Emergency transport response for medical crisis in rural communities improved through community communications facilities linked to improved transport services	% Emergency patients unable to reach health care in time: Expectant or postnatal mothers Children under 5 years
MDG 6 HIV/AIDS, malaria and other Diseases	Ensure transport sector ceases to be an agent for spreading HIV/AIDS	HIV/AIDS Prevalence among transport sector workers (public and private) HIV/AIDS prevalence rate in transport affected communities Inter-country coordination of actions relating to AIDS in transport
	Rate of road accident fatalities reduced by half by 2015	Rate of fatality (per million vehicles-km) Number of countries adopting road safety strategies

Cont't Table 2.2: The MDGs, and their Road sector targets and indicators

MDG 7 Environmental sustainability	Share of urban residents for whom mobility problems severely constrain access to employment and essential services Halved	% of households (in the various urban living environments) which report transport costs and time as major obstacles to employment
		% of households which report access as a major obstacle for essential Services
	Environmental sustainability promoted in all transport operations and development programs	Environmental impact identified by audits of programs undertaken
	Production of leaded petrol ceased by 2010	Number of countries banning sale of leaded petrol
MDG 8 for Global partnership development	Transport cost for landlocked countries reduced by half and their access to global markets improved, all TAH missing links completed and existing portions of regional transport corridors maintained by 2015	Percentage reduction of missing links of the Trans-African Highways (TAH) network and transit corridors. % reduction in transport cost for landlocked countries
	All non-physical transport barriers that increase journey time, customs clearance, border delay and impede the flow of goods and services dismantled by 2015	Proportion of countries that have reduced checkpoints along their main transit corridors to a maximum of 3 (between port and border of landlocked country). Proportion of countries that have reduced their border crossing time to OECD average. Proportion of countries that have reduced their port clearing time to OECD average.
	Axle load limits, vehicle and road technical standards harmonized between RECs by 2015	Proportion of RECs with harmonized axle load limits Proportion of RECs with harmonized standards for vehicles Proportion of RECs that have harmonized road design standards
	Air transport services improved fares reduced, and movement of goods and services facilitated in all African countries by 2015	Number of new connections between African countries established. Number of products and volume of traffic of products transported by air. Percentage reduction in air transport fares.

Source: AU/UNECA (2005): Transport and the Millennium Development Goals in Africa

2.7 Road Transport and the achievement of the Millennium Development Goals (MDGs)

2.7.1 Roads Transport and the MDGs in Lao

Poverty reduction

Roads have been one of the engines of poverty reduction in Laos. Poverty has reduced drastically in the country due to the connection of previously inaccessible areas to the transport network. About 87% of the poor in Lao resides in the rural areas (Warr, 2006). Warr (2010) revealed that though the incidence of rural poverty in Laos reduced by 9.5% in the period between 1997/1998 and 2002/2003, ―approximately 13% of this decline can be attributed to improved road access alone‖. In offering more insights into this road-poverty reduction causality, the study indicates that there is a high return to providing dry weather access to the most isolated households of Laos or those who have no road access at all (Warr, 2010:168; 2006:13).

More importantly, the improvement in seasonal roads to all-year-round motorable roads has high returns in reducing poverty. Within the period under study, rural poverty reduced from 42.5% to 37.6% and 25% of this decline is directly attributed to road upgrading (Warr, 2006). This is because the rural folks are open to easy access to markets, technologies and information that boost production and increase household incomes. The increases in production and incomes help reduce poverty and hunger in these remote areas.

In a similar study by Oraboune (2008), well connected rural areas in Laos are better off than other remote areas due to the improvement in market access associated with road linkages. With the improvement in market access, households are able to participate in economic activities which have the potential to ncrease their income source. Moreover, lowland areas along the Mekong corridor have comparatively higher average incomes vis-a-vis the poorly connected uplands due to the access to economic diversification activities that enhanced their livelihoods outside agriculture (Oraboune, 2008). Thus, there is a direct relationship between access to roads and the enhancement of economic opportunities which serve in reducing poverty in the rural areas. Considering the fact that more than three-quarters of the poor live in the rural areas, rural roads investment is one of the underlying factors in reducing poverty in the country.

Education

In treating education under the previous section, it was established that access to roads improve school attendance (participation) among rural children. This correlation is true in the case of rural Laos (see Table 2.3).

Table 2.3. Lao People"s Democratic Republic: Educational participation and road access, 2002-03

	All season Access	Dry Season Access Only	No Road Access	All
School attendance	80.67	70.48	51.90	69.41
Females	80.00	67.82	47.54	67.06
Males	81.37	72.98	56.27	71.72
Average expenditure on education (kip per student per month)	111,963	86,973	65,152	96,209

Source: Warr (2006)

Table 2.3 gives more insight into the correlation between road access and education in Laos. Access to roads has most effect on participation rate when dry season access roads are compared to no-access areas. Participation rate in areas with dry season access roads is about 19% more than areas with no access to roads. Again, parents tend to spend more on their wards with access to roads. Though attributing all these solely to road is misleading due to multiplicity of factors, especially household income, the significant role played by access to roads cannot be overemphasized. Again, the fact that there is an established relationship between access to roads and income levels in these rural areas makes the role of roads in increasing participation in, and expenditure on, education crucial in Laos.

However, the indirect effects of road transport related injuries may also reduce attendance and regularity in school. Accidents related to road transport to school and crossings have the tendency of increasing mortality and morbidity among school children, and these have a negative toll on participation rates.

Health

Access to modern medicine or health facilities in rural Laos partly depends on physical accessibility resulting from the availability of these facilities and road linkages. Table 2.4 indicates that access to roads contribute to the reduction of morbidty. A regression analysis by Warr (2006) using these variables showed that ―providing dry season road access has a powerful effect in reducing the rate of illness (significant at 2%)‖. In explaining this correlation, he indicated that access to roads, together with clean water, increases household hygiene. Again, the access to treatments offered by roads (see Table 2.4) help reduce infections from contagious diseases in households and communities.

Table 2.4: Lao People"s Democratic Republic: Health status and road access, 2002-03

	All season Access	Dry Season Access Only	No Road Access	All
Proportion of persons who become ill in the last 4 weeks (%)	13.31	13.37	15.63	14.07
Of those ill, those who did not seek treatment (%)	80.69	83.16	89.80	84.35
No treatment because is too difficult to get there (%)	11.83	24.83	24.10	18.55
Average days missed due to poor health (days per household, last 4 weeks)	0.58	0.58	0.76	0.64
Average expenditure on transport to hospital (ki per household per year)	102,958	72,460	50,564	85,494

Source: Warr (2006)

It can be deduced that, the access to roads has contributed to the reduction in infant and under-five mortalities in the country. A report on the achievement of the MDGs prepared by the Government of Lao PDR (GoL) and UN showed that between 1995 to 2005, under-five mortality and infant mortality have reduced from 170 to 98 per 1,000 live births, and 104 to 70 respectively (GoL and UN, 2008). Again, maternal mortality has decreased from 650 deaths per 100,000 live births to 405 within the same period (Warr, 2006). Though no causality has been shown between access to roads and these factors, the role of roads in improving these health indicators remains significant. The provision of rural roads, as indicated in Table 2.4, provides access to healthcare services to hitherto inaccessible remote areas.

It must be emphasised here that though road transport promotes access to healthcare services thereby reducing mortalities and morbidities associated with diseases such as malaria, it serves as one of the risks factors in spreading the HIV/AIDS pandemic in the country, especially in the rural areas. Roads have also been responsible for injuries and deaths in the country. In 2007 alone, there were 4,843 accidents, 8,512 injuries and 556 deaths through vehicular accidents in the country (Phoutsavath, n.d). Since 2004, accidents, injuries and deaths have been on the increase in Lao, especially in the capital Vientiane (Phoutsavath, n.d.). This indicates that whereas roads are increasing accessibility to healthcare services and decreasing morbidity and mortality, it has become a risk factor in increasing accidents.

Gender empowerment

The basic issue addressed by the MDGs under gender empowerment hover around access to education, non-agricultural jobs and political representation. In the area of schooling, Table 2.3 indicates that areas with access to all season roads or dry season only roads have better gender parity indices than areas with no road access. By implication, access to roads in rural Lao increases school attendance at the basic level. At the higher levels, such as secondary and tertiary, the effects of roads are minimal since several factors come to play. Again, by providing access to non-farm jobs, women along improved roads stand a better chance of diversifying their livelihoods than their counterparts living off-road.

Environment

As pertaining to every nation, road construction, improvement and use distort the environment. According to a report by the International Centre for Environmental Management (ICEM), protected areas and remote communities suffer extensively due to the environmental impacts of rural roads. The report indicates that, most roads can have serious negative impacts on biodiversity (ICEM, 2003:82).

Aside disturbing the ecology, air pollution has been associated with vehicles more than industrial and domestic practices. It is estimated that the number of vehicles, mostly motorcycles, has been increasing by 9% per annum and this poses threat to atmospheric quality in the country, especially the capital (World Bank, 2005.). Road transport in Vientiane is responsible for the emission of major pollutants such as Trisodium Phosphate (TSP_{10}), Particulate Matter (PM_{10}) and Carbon Dioxide (CO_2). It is said that ―particulate matter, especially has the most serious potential impact on health, including decreased lung function, cancer and possibly death from respiratory illness‖ (World Bank, 2005.).

2.7.2 Roads Transport and the MDGs in Brazil

Poverty reduction

Road development has been linked to the enhancement of socio-economic opportunities in rural areas in Brazil. According to Barcellos et al. (2010), among other factors, connectivity has led to the Brazilian Amazon undergoing ―structural changes‖ that has promoted regional development. Again, the construction and improvements of roads in Bahia State helped boost cocoa and coffee production since it eased marketing of produce and transportation of inputs and equipment (World Bank 1997 and 1998). It must be noted however that, this boom was short-lived. After the decline in cocoa and coffee prices in the 1990s, farmers suffered from global market crisis that made the production of these traditional crops unattractive. However, farmers were able to adapt to this economic downturn easily due to the availability of roads to promote economic diversification (World Bank, 1997 and 1998).

Further to that, Rondo (2008) indicated that extreme poverty has been reducing at a faster rate in rural areas (1.2% per annum) than urban areas (0.4% per annum). This was made possible through the implementation of income transfer programmes carried out by the government (Rondo, 2008). These transfers were able to reach remote areas due to several factors, but most importantly, physical accessibility. Again, the government has been able to improve food security in the country through three major routes: agrarian development; proper conditions for participation in the labour market; and increased access to food (Rando, 2008). The facilitative role of road transport in reaching the hinterlands, especially in Bahia State and Amazon cannot be overemphasized.

Education

As in Lao and almost every part of the world, the provision of roads enhances access to (better) education in Brazil. Children in urban areas in Brazil have better educational participation and longer years in school than those in rural areas. For instance while ―rural children study on average for 2.6 years‖, their counterparts in urban communities study 4.5 years on the average (Vasconcellos, 1997). The major explanatory factors are distance to school and the supply of schools and children who are unable to walk to school after the fourth grade are compelled to drop-out due to lack of access to transport services to attend distant schools (Vasconcellos, 1997).

Similarly, the World Bank (1997; 1998) indicates that school attendance has been growing since the 1990s due to the provision of feeder roads to link remote areas in the Bahia State. Children have been provided transport means to access higher order schools absent in their localities.

Health

Access to healthcare services remains one of the major factors for reducing morbidity and mortality in the world and the major means of accessing these services is through road transport. According to the World Bank (1997; 1998), attendance to hospital and use of hospital beds continues to increase in Bahia because of the provision of feeder roads. Again, Barcellos et al. (2010) indicate that off-road communities in the Amazon face the risk of malaria and its economic consequences than communities along roads due to the absence of healthcare facilities and the presence of mosquitoes in the forests. This means that among other factors, the closer the communities to roads or health facilities, the better the health of children, infants and mothers who are mostly at risk of malaria and other associated diseases.

However, they were quick to add that the advent of roads increases the risks of HIV/AIDS infection and the spread of other contagious diseases associated with economic booms and connectivity (Barcellos et al., 2010). Road-related morbidities and mortalities are also prevalent in Brazil. About ―30000 people die every year in road accidents. Of these, 44% are between 20 and 39 years of age, and 82% are men‖ (WHO, 2004). Further to the foregoing, it is recommended that efforts to improve access to healthcare services and health information through roads should run in tandem with strategies to reduce road-related catastrophes.

Gender

Issues of gender in education greatly disadvantage females at the secondary and higher education levels due to socio-economic and cultural reasons (Institute for Applied Economic Research [IPEA], 2004). There is no visible relationship between road transport and gender participation but cultural values mostly induce young men to drop out of school in search of jobs. Nevertheless, at the primary level, the situation seems to be different and a conclusion that resonates with the observation made under education may hold. This is because the absence of roads linking children to school may have different effects on girls and boys since boys have more ability to walk to distant schools than girls. Women‘s participation in nonagricultural labour markets and in decision making at the highest level continue to be a problem. It must however be iterated that in this case, culture is a better predictor than access to roads.

Environment

Road investment has had negative repercussions on the Brazilian en [vironment. It is linked to the destruction of forests in the country, mainly in the Amazon. Tropical forests have been the ―lungs‖ of the global carbon cycle, with Brazil accounting for 30% of these (IPEA, 2004). This implies that further ecological disturbances to the Brazilian forests pose threats to the globe in terms of ozone depletion and climatic change and variability.

Directly linked to the issue of climate change is the rate of fossil fuel consumption in Brazil. In an article by de Moraes João and Ferreira (2008), road transport in the states of Sao Paulo, Rio de Janeiro, Minas Gerais and Rio Grande do Sul have been touted as one of the major pollutants through the emission of CO_2. In these states, emissions totalled 819,887 GigaCO_2, representing 9499.67 KgCO_2 per capita. Sao Paulo for instance, has been identified as one of the cities in the world with poor ―unacceptable air quality‖ (Eggleston and Walsh, n.d.).

Despite the foregoing, research indicates that emissions depend on the amount of fossil fuel consumption which in turn depends on road conditions. Thus efforts to reduce emissions from road use in Brazil can look at the improvement of road conditions in remote areas.

2.7.3 Road Transport and the MDGs in Ethiopia

Poverty reduction

Poverty has been reducing in Ethiopia due to increased commitment of the government to poverty reduction strategies in the country. It has declined from 49.5% in 1994/1995 to 29.2%t in 2009/2010 with food poverty declining from 38% in 2004/2005 to 28.2% 2009/2010 (Ministry of Finance and Economic Development [MoFED], 2010).

Road development is one of the factors facilitating this process given the fact that many Ethiopians reside in rural areas. Bhatta (2004) indicates that in rural areas in Northern Ethiopia, ―nonfarm, transfer, wage, and off-farm incomes are significantly more for households with good access to road‖. Again, it has been established that ―providing more roads in rural areas with the construction of highways addresses the needs of the poor [in Ethiopia]‖ (Shumiye, 2010; see also AU/UNECA, 2005). Specifically, it has been shown that roads have the propensity to liberate some rural residents from the fetters of poverty. For instance, Dercon et al. (2007) showed in their study on ―The Impact of Agricultural

Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages‖ that ―access to all-weather roads reduces poverty by 6.9% points and increases consumption growth by 16.3%‖.

Furthermore, Wondemu (2010) has shown that:

"road infrastructure has a significant impact on rural income and poverty through shifting the market demand curve confronting farm households for the crop they supply, increasing farm productivity, fostering a competitive market environment, reducing transaction cost, promoting the profitability and reducing the risk of new technology adoption and increasing the market return to labour" (p. 264).

In all, it is evident from the presentations that road investments in Ethiopia have had positive effects on poverty reduction and elimination of hunger.

Education

Access to roads increases both literacy and participation rates in rural Ethiopia. In Bhatta's (2004) study, it was found that Northern Ethiopia was less endowed with educational facilities with sparse distribution of schools. However, though the ―educational status of people was poor, households with good access to road had better education status than households with poor access to road‖. Similarly, Bryceson, Bradbury and Bradbury (2006) assert that:

In Ethiopia, evidence suggests that social and physical infrastructure in improved road settlements are _accessibility-enhancing' by virtue of the fact that the government and other agencies are more likely to site social and physical service infrastructure at locations with good access, and service staffing is facilitated by good roads connection. Educated staff are less reluctant to live in rural places with good road access and bus services (p. 31).

Though the above assertion refers to social services in totality, it support the findings of Bhatta (2004). Access to roads has become a determinant of school locations, teacher allocations and willingness to teach in schools. This, in effect has influence on school participation, performance and quality.

Health

The health conditions in Ethiopia have increased tremendously over the years. Under-five and infant mortality rates have declined from 167/1,000 and 97 per 1,000 live births in 2001/2002 to 101/1000 and to 45/1000 live births in 2009/2010, respectively. Again, the maternal mortality rate has declined from 871/100,000 to 673/100,000 live births in 2001/2002 and 2005/2006 (MoFED, 2010).

Access roads' contribution to health improvements cannot be overemphasized. Bhatta (2004) indicates that, though health institutions are sparsely distributed with limited manpower, equipment, and drugs; households with good access had better health services. Again as indicated by Bryceson, Bradbury and Bradbury (2006), the availability of roads influences the availability of health facilities and services; and the posting of health personnel to rural areas (see, for example, AMDD, 2010).

Moreover, in Ethiopia roads are also said to ―reduce travel time to reach healthcare facilities‖, ―reduce physical efforts to reach health care facilities‖, ―reduce transportation cost to reach health care facilities‖, ―[enable] vaccination programs reach rural areas‖, and ―[enable] control of outbreak of diseases in rural areas‖ (AMDD, 2010).

However, in Ethiopia as in most of sub-Saharan Africa (SSA), road provision increases the spread of HIV/AIDS in two ways. First, road workers are either infected or infect people with the disease and secondly, it increases rural-urban interaction that exposes people to the disease (AMDD, 2010). Similarly, road accidents have been increasing in the country since 2002. In 2006 alone, there were 2,517 reported road traffic fatalities while reported non-fatal road traffic injuries in 2007 were 24,792 (WHO, 2009). Moreover, men have been the hardest hit, representing 78% of all fatalities (WHO, 2009). A study by Persson (2008) showed that ―in one crash the number of people killed or injured in Ethiopia is about 30 times higher than in the U.S.‖ The author concluded that ―road traffic accidents are a huge public health and development problem in Ethiopia‖ (Persson, 2008).

Gender

It is the aim of the MDGs to bridge gender gaps in access to education at all levels. It is reported that gender parity has increased to 0.93 for primary education in 2009/2010 (MoFED, 2010). The report notes, however, that ―educational gender gaps are larger in rural areas than in urban areas and have spatial variation‖. This makes the role of rural roads provision in achieving this target crucial. It can be said that access to roads, as reported by Bhatta (2004) and Bryceson, Bradbury and Bradbury (2006), has contributed to the improvement in the gender parity index tremendously. Again, women are the most affected in areas where access to roads is limited due to their ―transport efforts and burdens‖ (Zaid, 2011). Thus the extension of roads to remote areas will go a long way to reducing this burden and save time for other lucrative ventures that will increase their income levels and help women partake in household decision making.

Environment

Road construction and improvement is not friendly to the environment-notably forests, biodiversity and the atmosphere. The 2010 Ethiopian MDG report indicates that ―biodiversity is left in a precarious state due to factors such as settlement and investment activities that do not take biodiversity into account, the absence of a land use policy and land use plan and increasing amounts of toxic substances and pollutants‖ (MoFED, 2010: 40). Though this situation has a complex factor-causation, it can be said that road construction plays a major part.

Again, though road sector consumption has been minimal in Ethiopia, it increased from 3.7% to 4% in 2007 and 2008 respectively (World Bank, 2010). The transport and construction sector is responsible for 68.4% of greenhouse emissions in the energy sector, which accounted for 50% of total greenhouse emissions in 2004 (Engdayahu, 2007). This was twice the level in 1994 and indicates that efforts should be instituted by the government to curtail emissions from energy use, especially from fossil fuels in the road transport sector (Engdayahu, 2007).

In summation, the case studies clearly emphasis on goals covering poverty reduction and livelihood improvement, health, education, gender equality as well as the negative impacts on the environment. The areas covered include:

- Key transport goals under the MDGs

- Key areas of road impacts towards the achievement of the MDGs in the cases (actual/ planned impacts)
- The challenges in making transport an integral part of the MDGs achievements.
- How the achievement of the MDGs can shape and sustain investments in rural transport sector.

  The MDGs is at the verge of completion, to this end it is important to review the new approach to understand the areas for the roll over to enhance the sustainability of the revealed investments under the MDGs.

2.8 Beyond the MDGs: The place of Transport in the Sustainable Development Goals

With the end of the MDGs fast approaching the debates on its successor are intensifying. According to Muiderman (2013) two agendas are being pursued to the end of the MDGs: the Post-2015 development agenda (derived from the MDGs) and the Sustainable Development Goals (SDGs). The UN aspires to integrate both agendas in order to achieve the _future we want‘. The Sustainable Development Goals (SDGs) is the agreement that emanated from the United Nations Conference on Sustainable Development held in Rio de Janeiro in June 2012 (Rio+20). This, according to UN Secretary-General would replace the MDGs as he stated that *"the SDGs would pick up where the MDGs would leave off"* (UN, 2013). Adding to this, it was also identified from the United Nation Conference on Sustainable Development (2012) that the SDGs could build on the success of the MDG-framework. This therefore implies that beyond the deadline for the MDGs, activities in the present study can live on within the SDGs framework. The new framework also seeks to address most of the flaws identified in the MDGs (UN, 2012). For instance, the SDGs unlike the MDGs would be applicable to the world at large; since the MDGs only applied to the developing world. Regional differences among others, will be taken into account for high, middle and low income areas and not a one size fit all approach.

The Open Working Group (OWG) was established in 2013 and tasked with the responsibility to prepare proposals on the SDGs for consideration for the 68th session of the General Assembly of the UN, September 2013 - September 2014. Subsequent sections deal with the proposed goals, targets as well as focus areas.

2.8.1 Goals and Targets

The proposed goals and targets of the SDGs have been presented in Appendix 2.2. These goals and targets were proposed by Sustainable Development Solution Network (SDSN). There are ten goals and thirty targets; thus, each goal has three targets. Using these goals and targets as reference point the Sustainable Development Solution Network (SDSN) has proposed 100 indicators which would be used to verify whether these goals and targets would be achieved.

Njenga (2014) urges the transport sector community to work hard to ensure transport‘s inclusion in the SDGs framework. Partnership on Sustainable, Low Carbon Transport‘ (SLoCaT) is therefore the transport community‘s response to ensure the inclusion of transport in the new framework. SLoCaT argues that sustainable transport has more to offer globally and consequently relevant in securing ―The Future We Want‖ (UN, 2012). This is because the provision of transport infrastructure and services facilitate people participation in economic activities and enhances access to services. The UN (OWG) report 2014 also emphasizes the crosscutting element of transport to the sustenance of development as it addresses the mobility needs of people and freight.

The Partnership on Sustainable Low Carbon Transport (SLoCaT) regards large-scale implementation of more sustainable transport to enhance universal access to education and employment avenues, boost economic productivity and reduce poverty and provide a healthier environment. Sustainable transport influences agricultural production, the welfare of the vulnerable and facilitates equitable access and mobility to afford people the opportunity to enjoy services to enhance their lives. Entrepreneurs would also have access to a wider pool of human resources through enhanced accessibility; consequently expanding production and creating new investments and jobs.

SLoCaT reveals that Sustainable transport has not been integral as far as sustainable development is concerned and this could be attributed to the fact that the investments are in only one sector (transport). The benefits are however seen in various sectors. It is envisaged that there might be associated risks in dividing the transport targets among the other goals of other sectors. This is because these sectors cannot execute measures to enhance transport‘s impacts and also mitigate the negative impacts. Institutional coordination and capacity building can help mitigate these risks. Coordinated monitoring of transport elements of the post-2015 development framework across the SDGs is therefore needed.

Six main targets have been proposed by the SLoCaT partnership to help in the realization of the potential of other SDGs. These six targets culminate in the economic, social and environmental dimensions of sustainable land transport. The targets recognize the need to develop additional infrastructure and services where access needed for economic and social development has not adequately been provided. The targets also seek to ensure that additional infrastructure and services are developed in a more economically, socially and environmentally sustainable manner. The economic, social and environmental sustainability of existing transport infrastructure and services will be enhanced as well. The proposed targets are as follows:

- *Rural access:* Secure universal access by sustainable transport for rural population by 2030;
- *Urban access:* Secure universal access by sustainable transport for urban population by 2030;
- *National access and regional connectivity:* Facilitate national inclusion and regional connectivity by sustainable multi-modal freight and passenger services by 2030;
- *Road safety:* Halve the burden due to global road traffic crashes by halving the number of fatalities and serious injuries by 2030 compared to 2010;
- *Air pollution and Human Health:* Increase share of urban population living in cities with air quality within WHO limits; and

- *Greenhouse Gas Emissions:* Total world transport-related GHG emissions peak no later than 2020 then begin to decline at a 2% per year and at 2030 transport-related emissions are no higher than 2010 emissions.

The transition from the MDGs to the SDGs allows the unachieved goals to be rolled over to the SDGs. Again most of the shortfalls which challenged the attainment of the MDGs have been addressed. Further to this, it is hoped that there will be effective and efficient allocation of resources to the rural transport sector to enable it play its role effectively to bring about the desired sustainable development.

2.9 Conceptual Framework for the Study

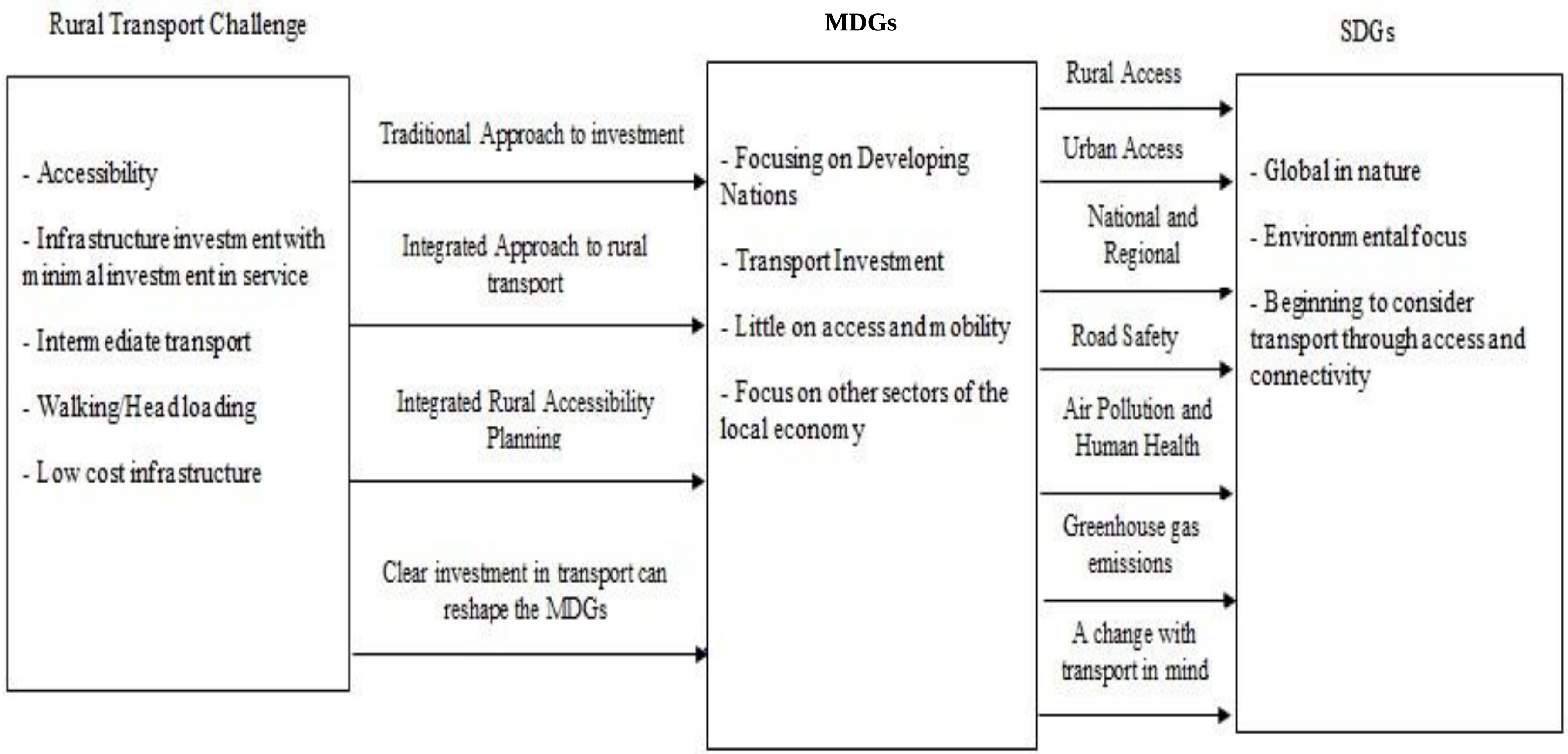


Figure 2.1 Connecting Rural Transport Invetments to MDGs

Source: Author‟s Construct, 2014

The literature on rural transport in the global south highlights accessibility and mobility as central to the rural transport problem. Key to the rural access problem are poor road network systems, headloading, inadequate and high cost of transport services. The fundamental cause of the rural access and mobility challenge has been minimal or lack of investments in rural transport infrastructure and services. This leaves rural dwellers with very limited options such as walking, head loading and the use of inter mediate transport services (as shown in Fig 2.1) to access basic needs, including market and health. Figure 2.1 connects the key issues in rural transport to the achiement of the MDGs and speculates the possibility of positioning transport as a key component of the proposed SDGs

In a bid to resolve the accessibility challenge various approaches have been employed. The traditional approach which was the first aimed at investing in roads to serve motorized transport. This failed to meet the need of the rural dwellers. A second approach, the Integrated Rural Transport Approach was therefore developed, which addressed the transport need of rural people to an extent, as the inter and intra transport needs were addressed. Though the IRTP solved their transport problems, the non-transport needs were still unaddressed. This led to the present approach the IRAP which not only deal with the transport but also the non-transport needs.

This approach is more friendly and holistic. Its application meant, investment in roads would enhance the achievement of the MDGs as well as improved access either through transport infrastructure and services provision to enhance mobility. The other side of the issue seeks the right location of facilities to bridge the access and mobility gap in rural areas. Access improvement will facilitate livelihoods improvement to reduce poverty and increase incomes. Enhanced income will thus boost consumption of goods and services, which include health and education. The adoption of the IRAP approach therefore has the ability to influence the realisation of the full impact on poverty reduction, rural livelihoods and improve access to basic services. Access to rural areas will be enhanced with investment in roads, there will be improved access to urban areas as well as regional access. The SDGs come to address the challenges inherent in the MDGs focussing on greener transport to address all the externalities from road investments. The SDGs will ensure that transport plays its role of connectivity well to achieve better access for rural people specifically and globally to address the environmental concerns surrounding transport investments.

2.10 Summary

The objective of this chapter was to review pertinent literature and concepts which form the basis for the development of the conceptual framework for the study. Major concepts with reference to the study objectives have been discussed. Some of the relevant issues discussed include the nature of rural transport, concept of rural accessibility, transport investment impacts, MDGs and specific country experience to inform the Ghanaian situation. The critical issue that came up in the review was that poor access is a character of poverty. To address this situation rural transport has to be viewed holistically and not based on sector as discussed earlier in the review.

It was realised that transport investment impacts the beneficiaries economically, socially and environmentally. The study was undertaken within a theoretical framework that rural accessibility challenge can be addressed effectively through the use of IRAP to enable rural people have access to their basic life sustaining services to reduce poverty generally and the MDGs specifically.

Rural transport is characterized by poor road network stemming from the non-maintenance of rural roads. This challenge leads to the poor condition of the road affecting rural dwellers access to both agriculture and non-agricultural employment. On the social side, the poor access deters rural dwellers from accessing basic facilities such as schools and health centres.

Domestic activities also take up a huge part of the household‘s time travelling to fetch water, firewood and grinding mill. This leads to rural people (especially women) spending much time and efforts on transport activities, which could have been spent on productive ventures which increase their income eventually. Consequently, more time is spent accessing domestic, economic and social facilities.

To address this challenge, the IRAP tool is employed to better understand the complexity of the problem which requires a holistic approach as evident in the IRAP because it comprises three parts namely:

- Infrastructure; Transport services; and
- Location of facilities.

The IRAP tool not only deals with the infrastructure (basic access) and transport services as was the case in the traditional approach. It is more robust, holistic, human centered and addresses the rural access problem from transport and non-transport perspectives.

Investing in feeder roads would therefore improve the road condition which would enhance the physical access of rural people to locations of need. All things being equal, improved access has the potential to increase productivity if other prevailing conditions are well placed including rainfall and application of fertilizer) to increase production. When production increases, income would improve which affects households' consumption and possibly savings as revealed in a Peru study. When this is resolved then MDG 1 which deals with hunger and poverty would be addressed to an extent because productive employment becomes available which brings in incomes and increase consumption bringing development to the rural community.

Again, the improvement of rural roads coupled with efficient and effective transport services would improve rural dwellers access to basic facilities and services such as health care if it is even far off from their villages where good roads and extensive availability and usage of IMT enabled long distance travel to facilities outside the community.

Further to this, educational access is also bound to be enhanced with efficient transport services as this improves enrolment and participation. Quality teaching and learning has the potential to improve human resource base of the community which would improve production in the long run. Incomes are likely to increase with rise in production which in turn enhances quality of life of the rural folk. This process would then lead to the achievement of MDG 2, as children will have safe access to school and quality service will be provided. Consequently, improvement in transport services would reduce cost and time spent as well as increase the frequency to facilities; for example, transporting goods to the market will be easier which can encourage farmers to produce more. Again, the provision of transport services has the ability to open up job opportunities outside agriculture as indicated by several studies earlier in the review.

Lastly, the appropriate siting of basic facilities including schools, clinics, and markets, grinding mill, water, and firewood would reduce the need to travel. This would go a long way to assist women and children who use much effort to get some household chores done.

Consumption of certain goods like water would increase as was the case in Zambia where close location of water points made residents closer to the facility consume more than those living further away.

It is also important that institutions responsible for the provision of facilities work together to enhance the achievement of the MDGs and beyond. The next section of the study presents methodology and how the data were collected and processed to address the research questions.

CHAPTER THREE

STUDY APPROACH AND METHODOLOGY

3.0 Introduction

This chapter presents the methodology and relevant analytical tools adopted for the study. The section also presents the tools used in establishing the relationship between transport investment and the MDGs in the study area. The components of rural accessibility are also assessed to understand the impacts improved access have had on the livelihoods and socio–economic development of rural beneficiaries and the overall impact on the MDGs.

3.1 Research Design

The quasi-experimental research design was adopted for the research work. This design involves the selection of an experimental group viewed as an _intervention‘ on which a treatment is tested for how well it achieves its objectives, as measured by a specified set of indicators. A series of observations are thus taken on the experimental group before and after the intervention to assess the result of the treatment. Although it picks its survey variables in experimental ways the design by definition lacks random assignment (Robson,2002). Quasi-experimental designs also identify a comparison group that is as similar as possible to the treatment group in terms of baseline characteristics. The comparison group captures what would have been the outcomes if the programme had not been implemented. Hence, the programme can be said to have caused any difference in outcomes between the treatment and comparison groups. The design have several merits, one being its usefulness in conducting pilot studies before huge resources are dedicated to it. It have been used and continue to be frequently used by researchers to evaluate the effectiveness of an intervention and address issues of external and construct validity (Shadish et al., 2002).

The approach is generally associated with two limitations. First, they do not allow researchers to determine the order by which variable occurs. Second, the designs does not utilise random assignment of participants to groups, there is greater likelihood that extraneous variables (variables that are not the focus of the study that cause confusion to occur when researchers consider the relationships between variables being studied) (Slavin, 2007) may impact the study‘s findings (Heiman, 1999).

The study specifically used the ―before‖ and ―after‖ and the ―with‖ and ―without‖ within the broader framework. The ―before‖ and ―after‖ consists of one experimental group on which a number of observations are made before and after an intervention (Robson, 2002). It is important that measures are taken before the treatment is applied and outcomes recorded after the intervention. The difference between the two values is considered to be the impact of the treatment. The before information usually serves as the baseline data as is the case in the present study where the ―before‖ data were collected in 2005, with the after data being collected in 2014 from the same corridors used at the baseline time. The approach has numerous advantages because it is simple to use, convenient, less costly and overcome the problems of randomized design. To Babbie (2009), the chief advantage of the ―before‖ and ―after‖ research framework lies in the isolation of experimental variables‘ impact overtime. However, it weakness, is the tendency of attributing changes that might have occurred overtime to an intervention that was made. Van de Walle (2009) shares similar view that change brought by the intervention is difficult to be separated from other changes independent of the intervention. Another limitation of the approach is its weakness in establishing cause and effect between the pre test and post test. In spite of the challenges posed by the approach some researchers believe it is still useful for impact studies. Cervero et al. (2007) applied it on longitudinal data. Martin et al. (2010) also used it and asked respondents to recall their mobility before the intervention. The problem of recalling can be a challenge in view of this, it is always better if measures are taken before a treatment is applied as this presents better outcomes.

The second method _with and without‘ approach helps to measure the mean outcomes between two comparable groups using longitudinal data. One group is exposed to the treatment while the other is not. After the application the difference is measured and if it is significant than what is recorded in the control area then the improvement can be attributed to the intervention. Its merit is that selection bias is minimized in terms of identifying the road impacts, because cause and effect can be assessed.

In view of the fact that the two impact study methodologies have inherent shortcomings, the researcher combined the ―with‖ and ―without‖ (using experiment and control groups) and ―before‖ and ―after‖ to assess the impact of the selected feeder roads on the attainment of the MDGs. The researcher used a control group with similar characteristics which were settlements in the same district, similar economic activities and the same rainfall patterns as the experimental group to test the validity of the research findings and rule out the possibility of extraneous factors such as government policy on say agriculture, which can contest the reliability of the research findings. The only difference between the control and intervention roads is that the control roads have not been improved. Figure 3.1 illustrates the ―before‖ and ―after‖ as well as the ―with‖ and ―without‖ methodologies used in the actual data collection.

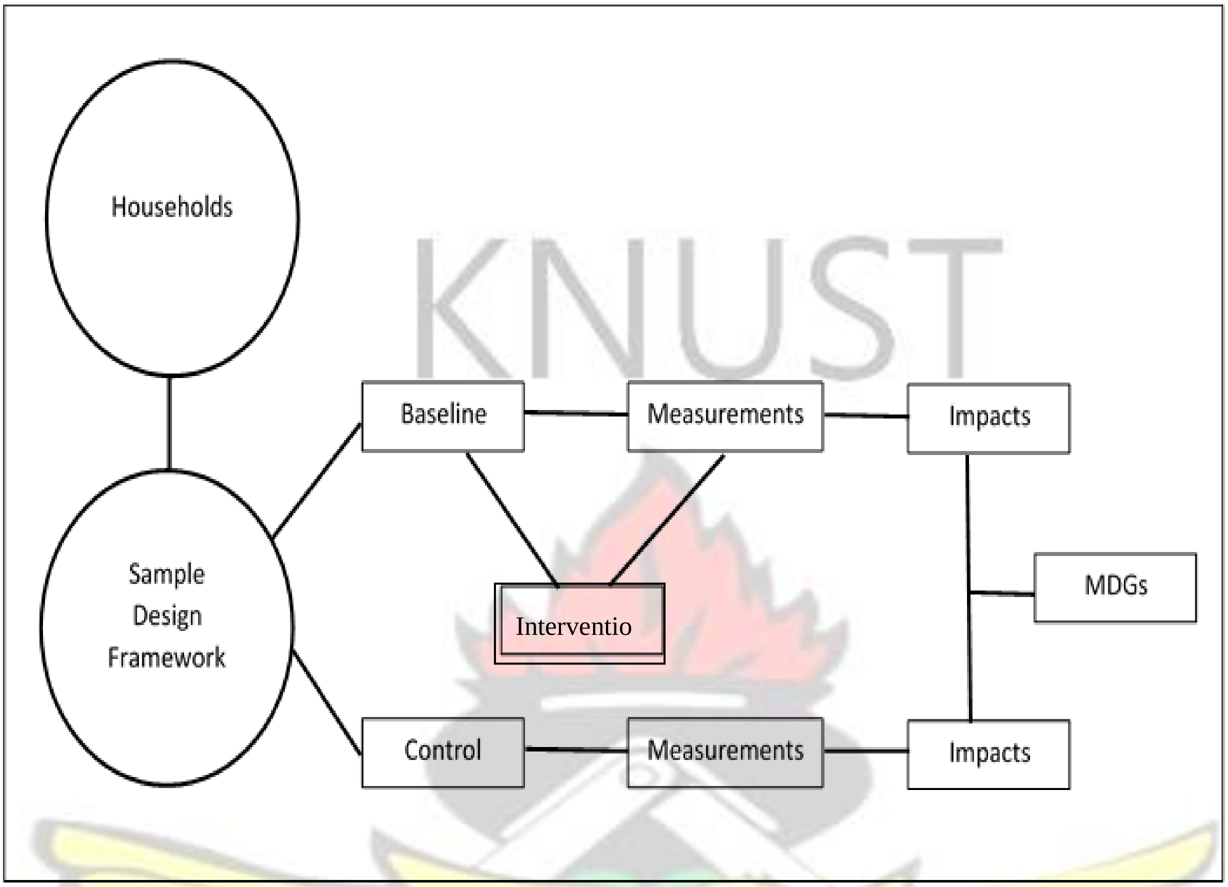


Figure 3.1 "Before" and "After" and "With" and "Without" application in the data collection

Source: Author's Construct, March 2014

3.2 Selection of the Study Communities

Roads have a spatial dimension and serve communities as well as enable households connect to their socio economic needs. Some researchers have emphasized that improved rural roads have diverse community-wide impacts on livelihoods and socio-economic development of the beneficiaries within the catchment communities and beyond (van de Walle, 2008). After the review of the baseline data, it came to light that 20 feeder roads received intervention under the RSDP project in 2005 in the northern sector of Ghana. Based on this, the present study selected four feeder roads (two each) from the Ashanti and Brong Ahafo regions. Four districts within the two regions having the improved roads were further selected. They are Sekyere South District, Bekwai Municipal, Jaman North and Wenchi Municipal. The communities along the selected road corridors within the selected districts were thus used for the study to collect data from households in these communities along the road corridors, since they are the objects that the road is supposed to impact. The major reason for the choice of these communities was because they were used for the baseline data collection, the data are available and the communities are along the corridors and stretches within 2km or 20 minutes walking time (Road Access Index) as recommended by the World Bank. The communities are shown on Figures 3.2 to3.5. The road corridors are next explored to understand the role played by them and how they have impacted on households‘ welfare.

3.3 Selection of the Feeder Roads Corridors for the Study

After reviewing the literature on rural transport it came to light that rural accessibility can be achieved through three indicators: infrastructure provision, transport services and the quality location of services. In Ghana generally and rural areas specifically, poor access is known to isolate the people from their basic needs. Therefore, any transport intervention is likely to address this isolation to an extent. It is generally assumed that once road infrastructure is provided transport services would be attracted and services and basic facilities will also come on board to relief rural poor people from their isolation. To confirm this view the present research applied criteria to select road corridors to assess their impacts based on the following consideration:

- Roads corridors rehabilitated under the RSDP Project in 2005;
Availability of baseline data on the RSDP roads rehabilitated in 2005;
Roads should be rural corridors.

To assess the impact of the roads and rule out any temporal issues from the improved road corridors and bring out the salient similarities and differences and better place the impacts, four non improved rural roads were also selected with the major criteria being that the roads share common characteristics such as being in the same district and similar economic activities, among others. The only difference being that the road has not been improved.

It is important to state that, the roads used during the baseline period in the selected districts were maintained (Agona-Wiamoase corridor in Sekyere South, Poano-NtinakoAdoowa corridor in Bekwai Municipal, Awisa–Atuna corridor in Wenchi Municipal and Old Drobo–Ponko 1 corridor in the Jaman North District) for the present study so as to have a good basis to establish changes that may have occurred over the period. Using the same roads will also make comparison easy and meaningful. Another reason for conducting an impact assessment on the selected roads is that the baseline data and two monitoring surveys have been done already which presents a good trend with longitudinal data (van de Walle, 2008). The results of the intervention have thus, been covered. It is therefore necessary to collect data after a long period as suggested by van de Walle (2008) to assess the impacts of the road. The interval between the last data collection period to the data collection time in the present study is approximately 7 years which is long enough for the emergence of some impacts. All the intervention and control corridors have been shown on the maps in Figures 3.2 to 3.5.

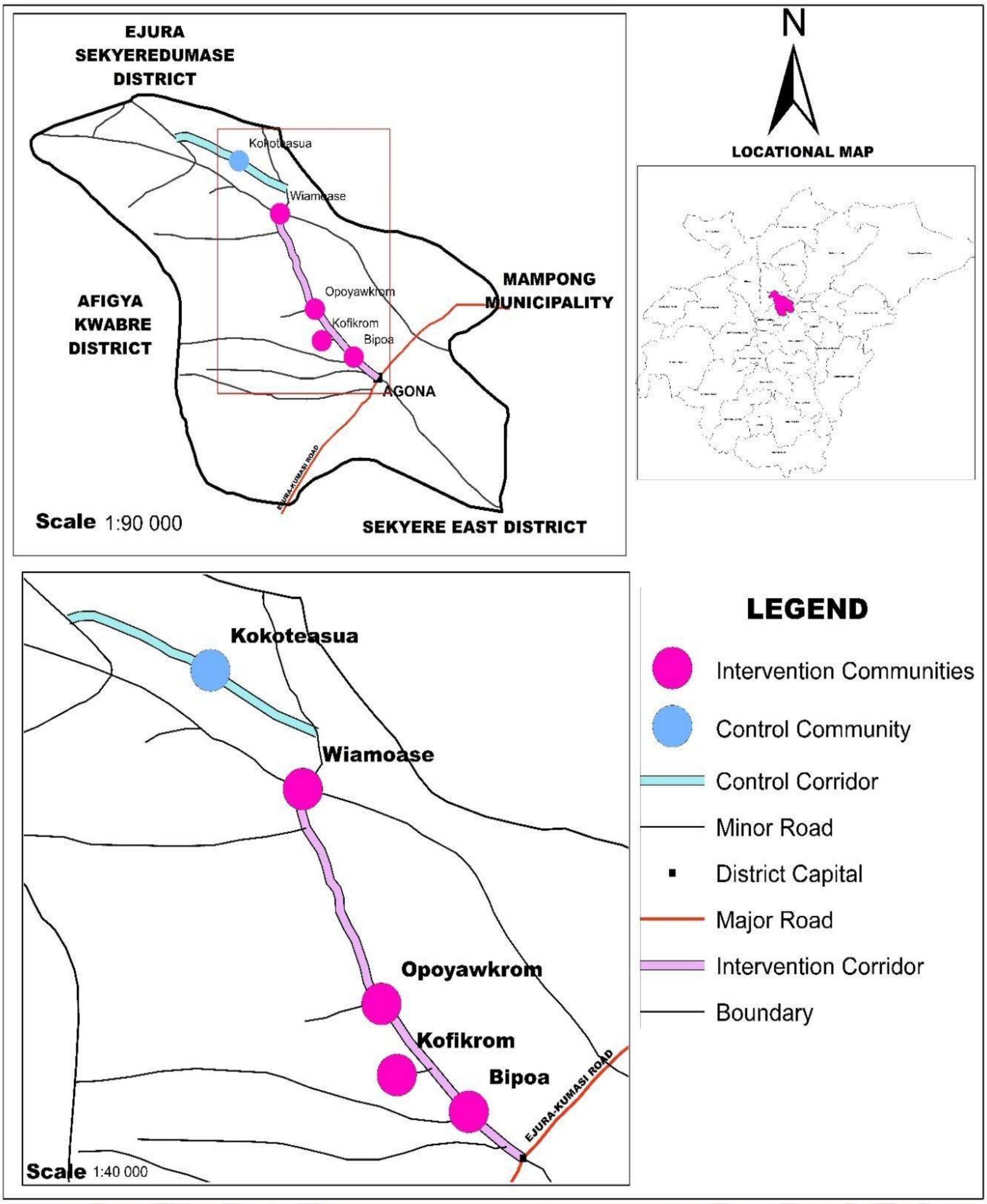


Figure 3.2: Sekyere South District showing selected corridors and communities

Source: Sekyere South MTDP 2010-2013

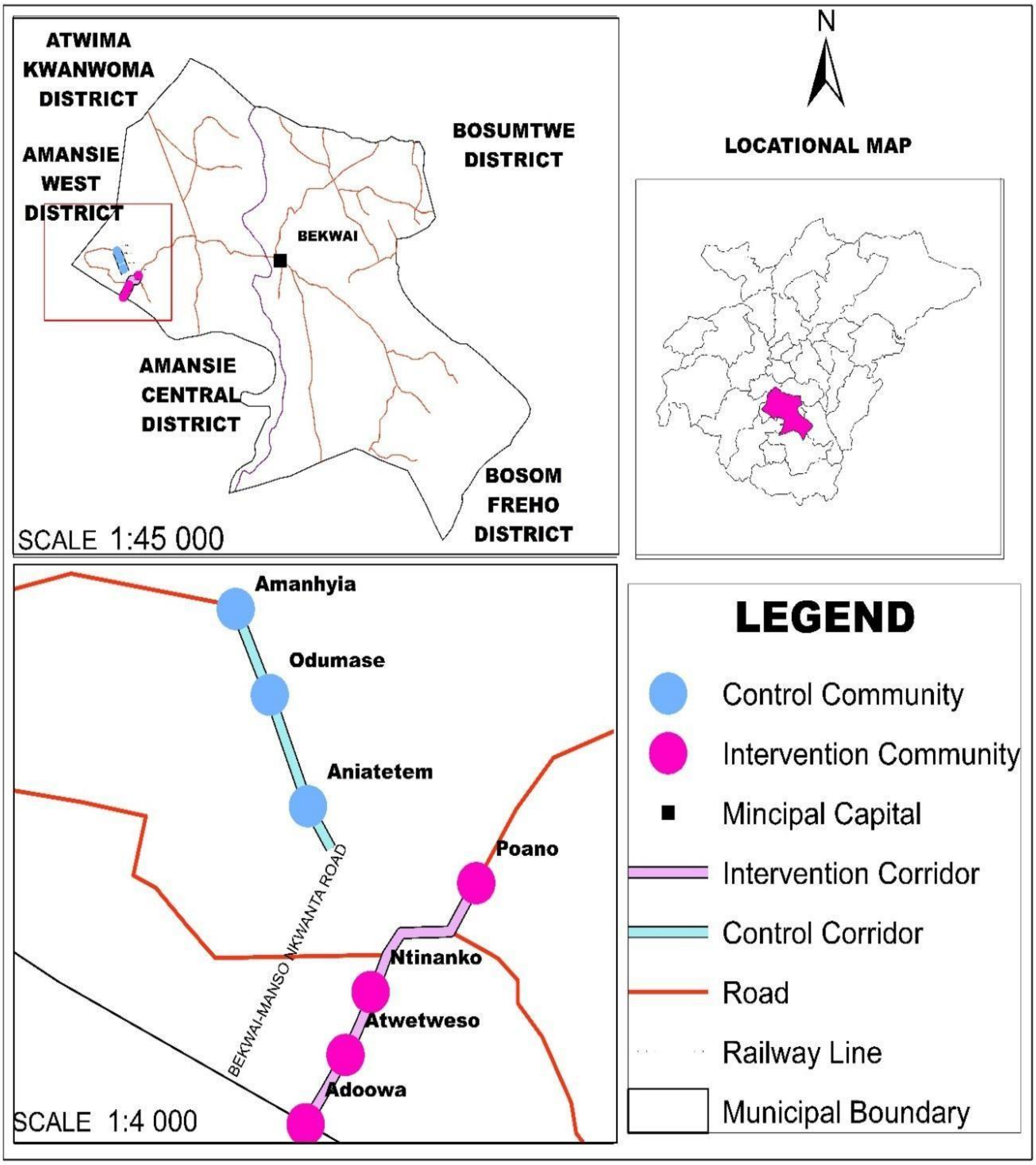


Figure 3.3: Bekwai Municipal showing the selected roads and communities

Source: Bekwai Municipal MTDP 2010- 2013

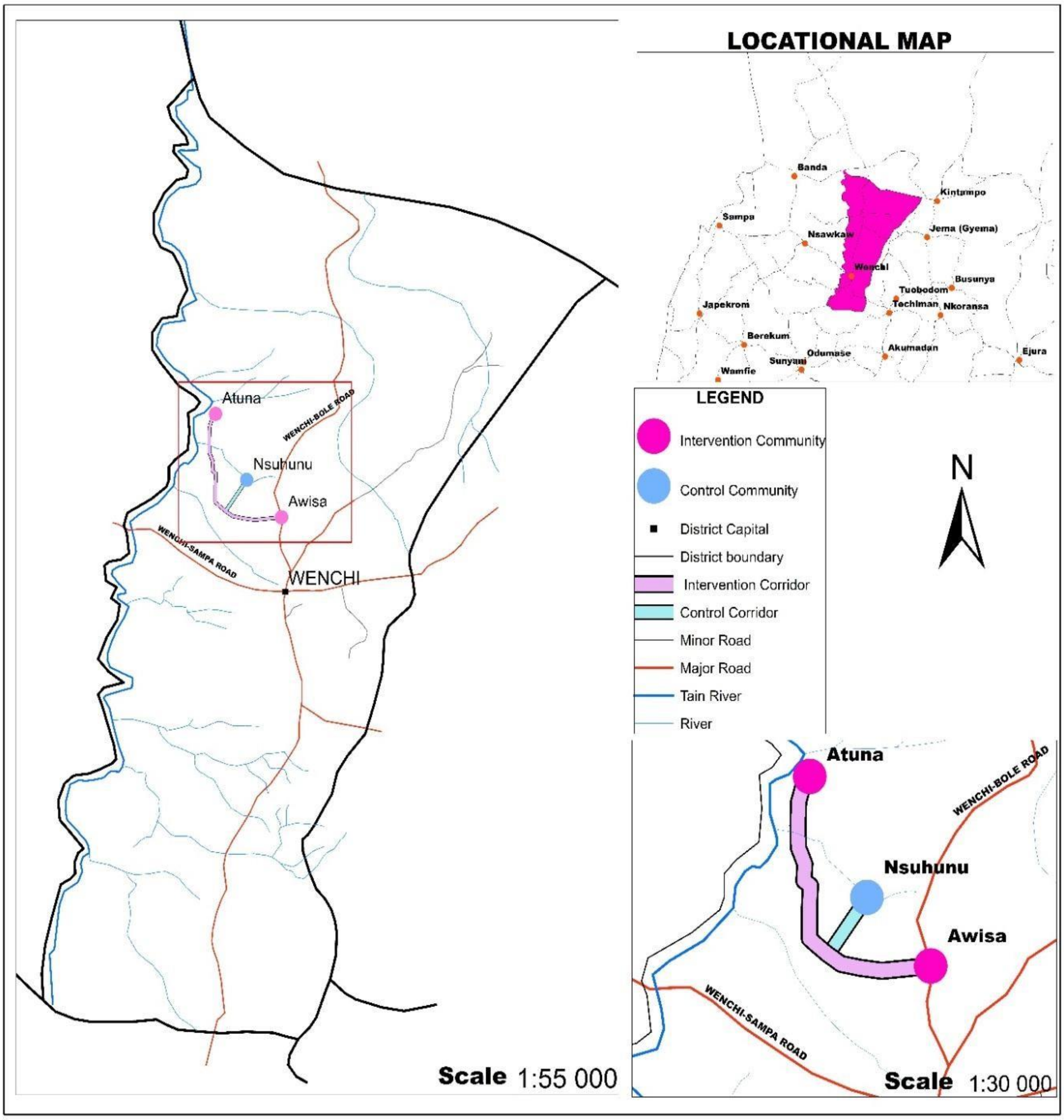


Figure 3.4: Wenchi Municipal showing the selected roads and communities

Source: Wenchi Municipal MTDP 2010-2013

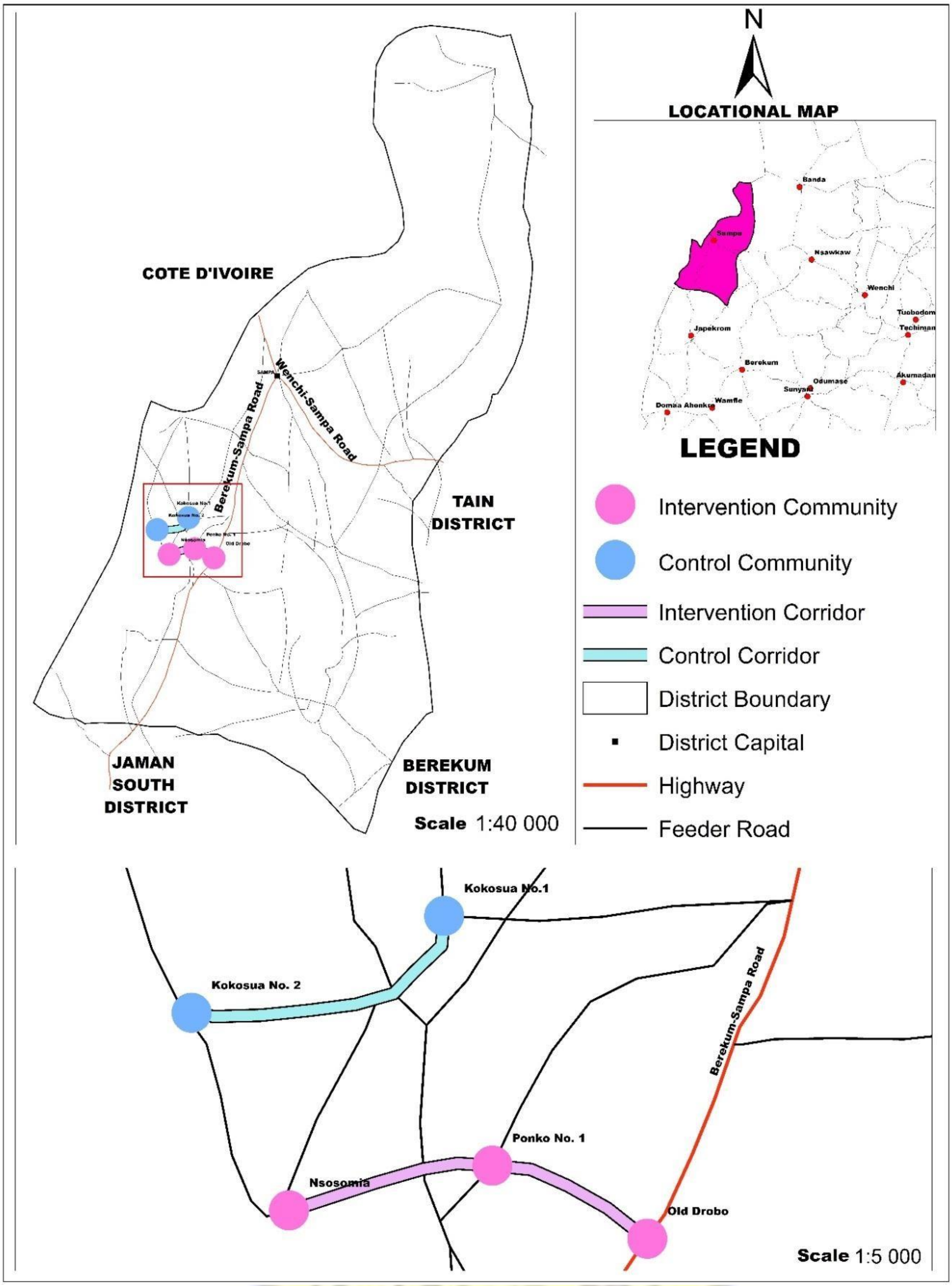


Figure 3.5: Jaman North District showing the selected roads and communities Source: Jaman North MTDP 2010-2013.

3.4 Sample Size Determination

Following the selection of the research communities, the total number of households to be interviewed was determined. This was done by finding the total number of households in each community which was then summed them up to obtain the corridor population. After which Miller and Brewer‘s (2003) formula as shown in equation (1) was applied to find the corridor sample. With a confidence level of 95% and an error of margin of 5%, the total number of households required for the study was determined using the formula:

$$n = \frac{N}{1+N(\alpha)^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where n = sample size, N = total number of households on the study corridors, α is the error margin at 95 percent confidence level (Miller and Brewer, 2003).

The total number of households on the respective corridors was used as the frame together with a 95% confidence level and a 5% margin of error to calculate the sample size for the corridor. Following the determination of the sample size for each corridor, the study sample then prorated based on the number of households in each community to determine their respective sample sizes. Simple random sampling technique was then used to select the households to be interviewed in each community along the intervention and control corridors. For details on the sample size (see Table 3.1).

Focus Group Discussions were held with a section of the community which was representative of the composition of the study population, to ascertain the impact of the feeder roads investment on their living conditions as they are the people living within the catchment areas of the intervened feeder road corridors. Key informant interviews with the Assembly Members, traditional leaders and heads of institutions such as schools and health facilities were also done. Regarding the economic actors such as transport operators, the researcher used accidental method to select those who were available at the time of the survey.

Table 3.1: Intervention Road corridors by Household Populations and Sample sizes

District	Corridor Name	Community	Corridor Household Population	Corridor Sample (n)	Households to be interviewed
Sekyere South	Agona-Wiamoase	Wiamoase	2,847	363	254
		Bipoa	1,024		87
		Kofikrom	8		15
		Oppong Yaw	15		7
Bekwai	PoanoNtinanko-Adoowa	Adoowa	156	250	58
		Ntinanko	502		175
		Atwetweso	10		17
Wenchi	Awisa-Atuna	Atuna	14	163	21
		Awisa	261		142
Jaman North	Old-Drobo-Ponko No. 1	Nsonsomea	225	209	130
		Old Drobo	100		38
		Ponko No. 1	82		41

Source: Field Survey, March 2014

Table 3.2: Control Road corridors by Household Populations and Sample size

District	Corridor Name	Community	Corridor Household Population	Corridor Sample (n)	Households to be interviewed
Sekyere South	KokoteasuaWiamoase	Kokateasua	37	37	37
Bekwai	Aniantentem-Amanhyia-Odumase	Aniantentem	18	38	9
		Amanhyia	21		19
		Odumase	11		10
Wenchi	Atuna-Nsuhunu	Nsuhunu	12	12	12
Jaman North	Kokosua No. 1& 2	Kokosua Number 1	9	37	9
		Kokosua Number 2	29		28

Source: Field Survey, March 2014

3.5 Study Variables and Type of Data

Premised on the research questions, the hypothesis and the objectives, the following variables, indicators, type of data, as well as the field tools employed and the sources from which the data will be collected are presented in Table 1.1.

3.6 Data Collection, Processing and Analysis

The study used both primary and secondary sources of data to provide the required responses to the research questions. The secondary sources refer to data collected from books, journals, Road Sector Development Programme (RSDP) reports, newspapers and the internet on topics related to transport investments and the MDGs which provided the conceptual and theoretical frameworks within which the study was pursued. In addition, the secondary data included problems of rural transport, evolution in rural transport, current focus on Integrated Rural Accessibility Planning (IRAP) with components such as infrastructure provision, transport services and location of basic facilities and the MDGs indicators among others.

The primary data also refer to data collected from the field with the use of questionnaires, observations and interviews that were carefully granted with households. These data provided the empirical facts to address the concepts and identified variables in the secondary data set.

The primary data gathered comprised items to address the socio-economic situation of the road users (households, passengers, vehicle operators, traders etc), issues such as the household and socioeconomic characteristics, consumption levels, and the occupation of the road users. Data on the mobility pattern of households was also obtained by collecting data on the means of transport used to access basic needs, the frequency of travel, travel cost and time. Accessibility was also assessed by capturing the condition of the feeder road, the paths, the tracks, the trails, the location of facilities and the mobility issues.

The survey for gathering primary data was done in two phases. The initial one took three weeks from 16th March, 2014 to 3rd April, 2014. The second phase was for 5 days from 9th June to 14th June, 2014. The first survey was to collect comprehensive data on the selected communities. The team spent 5 days in each of the districts. The second survey was to collect additional data to fill the identified gaps in the dataset from the first survey.

The objective of the study was to collect adequate, relevant and reliable data to ensure that the research questions are properly answered. In view of this, several methods were used in the actual data collection. A reconnaissance survey was first carried out to observe the state of the roads shown in Figures 3.2 to 3.5, which received intervention in 2005 under the RSDP, in the selected districts. The communities used at the baseline period were also visited to familiarize the team with conditions on the ground. The researcher also established contacts with identified stakeholders among them were Ministry of Transport, Ashanti Regional Feeder Roads Department, Brong Ahafo Regional Feeder Roads Department, Bekwai Municipal Assembly, Sekyere South District Assembly, Jaman North District Assembly and the Wenchi Municipal Assembly as well as District Directorate of Agriculture, Department of Education, District Health Services in all four districts selected for the study. The traditional leaders and the other leaders at the community level in the respective communities were also interviewed (see Appendix 3.5 for a sample of the Interview Guide).

The institutions were interviewed first to better understand pertinent issues related to the roads, such as reasons for the selection of the roads for intervention. Department of Feeder Roads was directly involved in the rehabilitation or maintenance of the roads, so the state of the road before the intervention, the length rehabilitated and maintenance after the implementation were all ascertained from the department. Structured questionnaires were used to obtain these data (see Appendix 3.5 for a sample of this instrument). Questionnaires were used to collect socio- economic data from household heads, farmers, traders, passengers and transport operators (Samples are attached as Appendices 3.1, 3.2 and 3.3 respectively). Finally, traffic volume data were collected through limited surveys on market and non-market days and by the teachers in the communities which had schools. The condition of the roads, passenger traffic as well as the incidence of head loading along the roads and sale points were also observed.

The sampling technique used to collect the household data was multistaged. The steps used are summarized as follows:

a) The selection of four road corridors was the first step and this was done purposively from the 20 feeder road corridors improved under the RSDP in the Northern Sector of the country;
b) The second step was the selection of communities along the chosen road corridors in (a) above used at the baseline period to aid comparison; and

c) The final stage of the inquiry was the selection of households within the communities above, with this each community was divided into four parts and the houses selected randomly in each part, then one household is selected from a selected house, then one household head is finally selected to be interviewed until the sample number for the community is exhausted. The interviews cover the impacts of the improved roads on their socio economic status including transport cost savings, travel time reductions, employment enhancement and frequency of accessing basic facilities and other household data as well as data on other members of the household).

To address the objective on the impact of feeder roads on economic activities towards poverty reduction, households, traders, vehicle operators were interviewed to determine this. The traders were selected through their associations where individuals were selected using purposive sampling as these units would help to answer the research questions. Issues such as output levels, income and consumption after the road improvement were also collected from the sample units. Transport operators and passengers were picked using the accidental approach. This approach is appropriate to cover units at either the origin or destination of their trip and interviewed using semi structured questionnaires as this helps to elicit both qualitative and quantitative data for better understanding and interpretation of the data collected (See Appendix 3.1) for a sample of the questionnaire.

To triangulate the responses from the household heads four focus group discussions were held in the communities covered. There were mixed FGDs and gender specific ones as the transport needs and impacts differ as shown in the literature. The intent was to validate the responses elicited from households individually earlier on as this is also an opportunity to capture issues which individual households may have forgotten. Semi-structured questionnaires were used to ask questions with regard to the benefits households have derived from the road investment. Specifically, issues covered were the impacts on their economic activities, income levels, expenditure, impact on their access to health, market and school children‘s access to educational facilities. These issues were deemed important as they helped to better understand their perception on the road and interpretation of the impacts. Control communities were also selected purposively from the same districts but they lie outside the catchment area of the experimental roads. The criteria for the selection of such communities were similar to the experimental communities in terms of the attributes (population, economic activities, rainfall pattern, soil fertility, among others) with the only difference being the rehabilitation or maintenance of the road. The selected communities are shown in Figures 3.2 to 3.5.

The data collected from secondary and primary sources were both quantitative and qualitative. After the data collection the next step was the processing of the data. The processed data were analysed to provide answers to the research questions. The quantitative data were edited, coded and then tabulated. Editing was done with the view to detecting and eliminating errors to ensure clean and reliable data. Coding was also done by classifying questions into meaningful categories in order to bring out important patterns like mobility, welfare levels and accessibility level. Data were finally presented in the form of tables and graphs to facilitate the analysis. Data were disaggregated and cross tabulated. Other research techniques such as regressions, mean–comparison and correlations were applied in analyzing the responses obtained. It is important to mention that, the impact analyses were done at two levels. First, for each of the roads and communities considered, comparison between the ―before‖ situation and the ―after‖ conditions, where data on the baseline condition were available, otherwise the ―control‖ and ―intervention‖ data were utilized. Hence, the conditions in the selected project road corridors were compared with those along control road corridors. The reason for applying a variety of techniques was to authenticate the evidence presented and to make generalizations possible. The SPSS version 18 software was used to analyze the field data. The process of data collection to the analysis had a few challenges, for example there were instances that several houses did not have the household heads present at the interview time allotted to the community which called for rescheduling of activities. Some institutions did not have the key respondents at the time of the interview which delayed the analysis process.

3.7 The Research Process

This is a frame which aids, directs as well as connects the various processes from literature to the draft report. Figure 3.6 presents the sequence in the study from the research design through the pilot survey to the final report.

After the first data collection on both quantitative and qualitative variables as indicated in Figure 3.6, an initial analysis was done to ascertain the emergence of patterns and relate them to literature. The gaps identified led to a further collection of data from the field, to address the outstanding issues. The comprehensive data were then analyzed, using cross tabulations and correlations where applicable. The findings of the study were further related to the literature to lift and contextualise the discussion. The relevant recommendations were made and the contribution of the study outlined together with areas for future research presented. The next chapter presents the analysis and discussions of the field data and how they assisted the researcher answer the research questions.

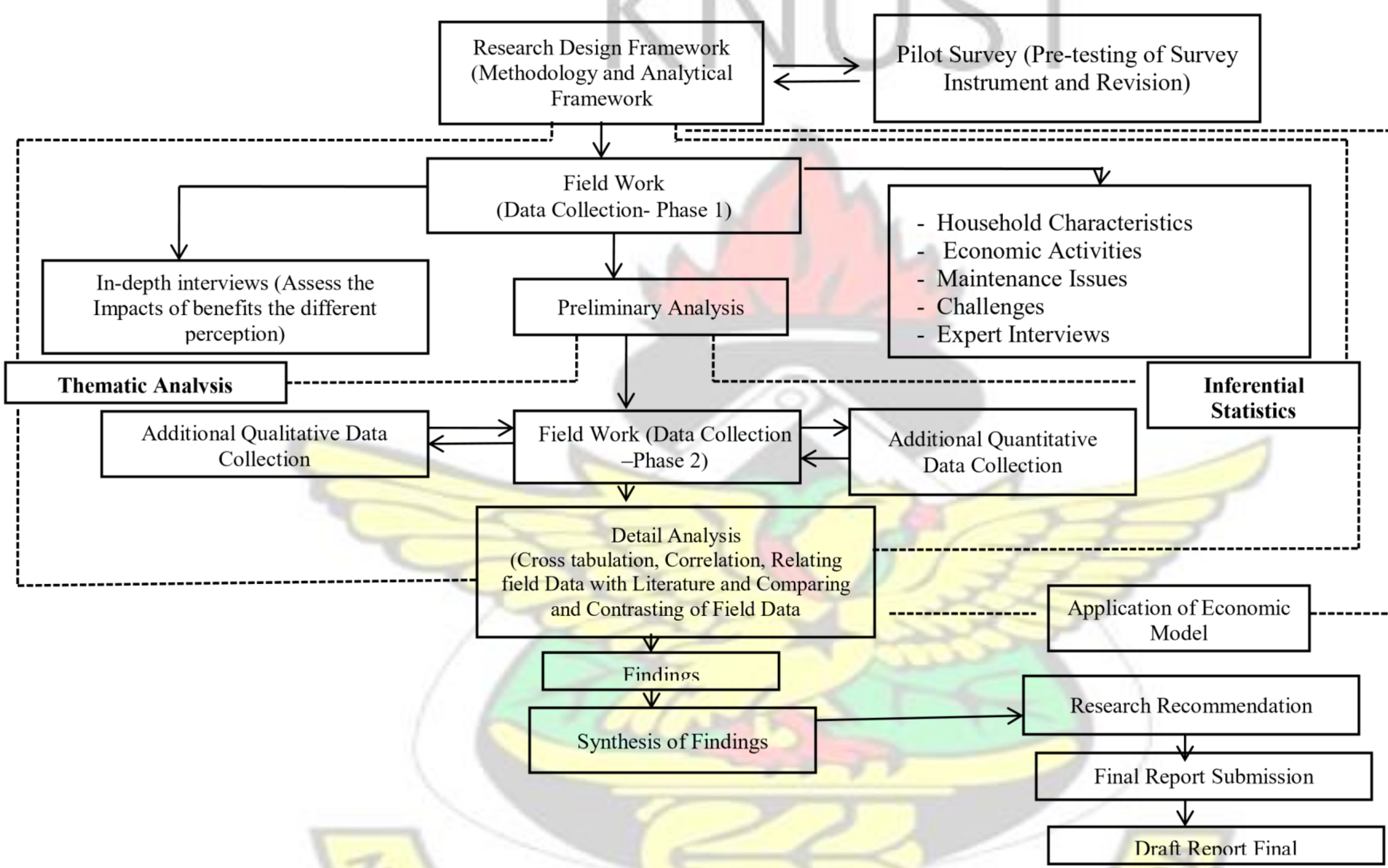


Figure 3.6: The Research Process for the study

Source: Author‘s Construct

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF FIELD DATA ON TRANSPORT INVESTMENTS AND THE MDGs

4.0 Introduction

Chapters 2 & 3 of the study presented the theoretical basis and the framework for undertaking the study respectively. This chapter presents and discusses data on households, vehicle operators and passengers. On the household front, data gathered and presented include background characteristics of households which include: age, sex, educational level and occupational status. Data on households‘ access to basic facilities were also gathered including, average travel time and cost in accessing markets, educational and health facilities as well as extension services. Data on the mode of travel used to access the facilities and the average distances covered were also gathered.

Data on vehicle operators were collected on both the control and intervention corridors to confirm the distances to the various facilities and the average travel time _before‘ and _after‘ the intervention, to better evaluate the impacts from the road investments. Where data were available on the _before‘ situation they were used. . Data on vehicle operations gathered included the vehicle capacity, fares charged, hours worked in a day, number of trips in a day, travel time, and distances covered.

The data presented were gathered using interview guides, questionnaires and focus group discussions. In all, 985 households were interviewed on the ―Intervention‖ corridors with 124 on the ―Control‖ corridors added to data on 89 households provided for in the baseline situation. Fourteen focus group discussions were held on both the ―intervention‖ and ―control‖ corridors. In addition, 100 passengers and 60 vehicle operators were interviewed to validate some of the data obtained from the households. The data on households were gathered from the sampled houses along the selected road corridors. The data on passengers and vehicle operators were also collected at the various vehicle waiting points in the selected communities along the selected road corridors, Department of Feeder Roads, District

Department of Food and Agriculture, District Education Service and the District Health Services were also contacted on issues pertaining to the study variables.

The major challenge encountered at the time of the data collection was the inability of some households to give the precise impacts of the roads on their lives. This challenge was however addressed by gathering data from multiple sources including passengers, vehicle operators and focus group discussions at the various communities along the road corridors as well as from the institutions in the four study districts. This chapter therefore presents data collected from the field surveys which served as inputs for the presentation, analysis, and discussion of the results.

4.1 Background Characteristics of Households

4.1.1 Age-Sex Distribution of Households

The sampled population of communities along the intervention corridor totalled 985 households while the baseline had a sample of 89 households (see Table 4.1). The control communities, however, had a sample size of 124 households which is higher than the baseline sample. Of the figures sampled, the males constituted 54.2% while females represented 45.8% on the intervention corridor (see Table 4.1 for details), representing a male/female ratio of 1:0.85. This figure is higher than those recorded on the control and baseline, although the male dominance was consistent. The control and baseline situations revealed a male/female ratio of 1: 0.32 and 1: 0.12 respectively. These values vary from the national figure of 1:1.05 for the male/female ratio (GSS, 2012).

On the reduction of the female figures, one female respondent at Ntinanko an intervention corridor had this to say,

"Some of my friends have relocated to the Kumasi and Bekwai with the road improvement to trade in industrial goods and only come during harvest to help their husbands"

The reduction in the female figure can be attributed partly to the road improvements allowing some to locate to urban areas to engage in other economic activities as confirmed by Gachassin, Najman and Raballand (2010) as well as Escobal and Ponce, (2002) in work done elsewhere. The male dominance can be attributed to the land ownership and labourintensive activities such as farming, which was the predominant occupation in the study areas and undertaken largely by men. This was confirmed on the Poano-Ntinanko-Adoowa and Old–Drobo corridors where the large scale production of cocoa and cashew, had males outnumbering females. This implies that improvement in roads have enabled easy movement from the communities which has boosted households mobility and enhanced their access to the needed services.

Table 4.1 Characteristics of the household heads along the Baseline, Intervention and Control Corridors

Variable		Baseline[1]		Control[1]		Intervention	
		Freq	**%**	**Freq**	**%**	**Freq**	**%**
Sex	Male	77	90	93	74.6	534	54.2
	Female	9	10	31	25.4	451	45.8
	Total	**86**	**100**	**124**	**100**	**985**	**100**
Educational Status	None/no formal education	33	38	34	27.7	207	21.0
	Primary	16	19	29	23.1	140	14.2
	JHS	32	37	42	33.8	406	41.2
	SHS	3	4	11	8.5	173	17.6
	Technical/vocational	-	--	5	3.8	33	3.4
	Tertiary	2	1	3	3.1	26	2.7
	Total	**86**	**100**	**124**	**100**	**985**	**100**
Occupation (Economic Activity)	Service (formal)	1	1	3	2.3	43	4.4
	Service (Informal)	5	5.9	18	14.6	239	24.3
	Industry	2	2	2	1.5	27	2.3
	Agriculture	78	89.2	95	76.9	622	63.1

[1] Constituent communities are; Aniatetem, Amanhyia, Odumase, Kokotesua, Nsuhunu, Kokosua 1 and 2.

Majority of the population in the study communities fell within the 15-64 age cohort. On the intervention corridor as 50% of the active population were in this age cohort but the figure for the control corridor was slightly higher at 52%. Both figures are lower than the national average of 57.1% (GSS, 2012). The figure for the control corridors could be as a result of the limited opportunities for the working class. The corridors presented varying views as Agona- Wiamoase corridor, an intervention corridor, had the highest proportion of the active population. This could be because of the role communities along the corridor play as residential abodes for the working class on account of the influx of services like

	Unemployed	-	-	6	3.1	54	5.5
	Total	**86**	**100**	**124**	**100**	**985**	**100**
Age	Average Age (Years)	46		44		45	
	Household size	5.1		5		4.9	

Source: Field Survey. March 2014.

[1]Constituent communities are; Ntinanko, Adoowa,Wiamoase, Bipoa, Kofikrom, Atuna, Old Drobo, Ponko No.1(For Intervention – Atwetweso, Oppongyawkrom, Nsosomea, Awisa were additions)

schools, health facilities and a transport terminal which connects to different locations and a weekly market. An added advantage could be the ease of accessing vehicles to all locations within the district which is also an effect from the road improvement.

Although the average age on all corridors was above 40 years, about 10% of the farmers on the control corridor were above 70 years while about 20% were also below 30 years. This implies that the aged, who are still healthy, take up some activity to cater for themselves and reduce the burden on the working class as confirmed by the proportion of the 65+ which was only 4% on the control corridor and lower than the national figure of 4.7% (GSS, 2012). The youthful working class implies that households may require the road to enhance their economic activities and retain them in farming rather than shifting to other sectors, such as commerce. The baseline percentage of dependent population was lower at 17.3%, while that of the intervention and control corridors recorded 44% and 43% respectively. The figure on the intervention corridor (44%) is higher than the national figure of 43.1% (GSS, 2012). This implies a greater burden on the working class, as most of these people were possibly in school, as will be revealed in the educational data later on in this chapter.

The low baseline figure may be explained by the extensive use of young people on the farms instead of being in school. A study by the MMYE(2007:127) in the country support this view as 33% of children were involved as farm hands on cocoa farms because the children had to contribute to household incomes. The study further stated that children from 5 – 17 years were involved in varying jobs to perform on the farm. In Cameroon, Thorsen (2012) also found that teachers were using students on their cocoa farms and hiring them out to local farmers during school time. This situation, worrying as it can be, implies that whenever children are needed to perform a task their location and relevance of the prevailing activity becomes secondary to assisting the older person.

The burden is worsened by the aged group which adds to the 0-14 years cohort. In comparison with the national figure of 4.6% the aged burden is more manageable on the control corridor than the intervention and baseline corridors (4%, 6% and 7.3% respectively). An old man in Bipoa an intervention corridor explained that the improved road had improved his access to health facilities,

" I am a diabetic patient l used to visit the hospital twice a year but the road improvement has enabled me to visit every other month which l believe has improved my health to date."

A possible reason could be the ease of accessing transport services to locations of interest such as health facilities. It was however surprising that the baseline communities had a significant number of aged population. It would also appear that most of them were born in the communities and had lived there all their lives. The educational status of households is equally important in assessing the background features of the population along the corridors.

4.1.2 Educational Status of Household Heads and the Size of the Household

Education is important as it broadens people‘s understanding of pertinent issues critical for the development of any economy. In view of this, educational level of household heads along the baseline corridors was compared to those prevailing along the intervention corridors to better understand the changes over the period, together with the control communities. However, those who attained primary education on the control corridor recorded the highest of 23.1%, followed by the baseline corridor at 19% and the intervention corridor at 14.2%. The results, as revealed in Table 4. 1, indicate that those who had up to JHS education formed the highest group on the intervention corridors of 41.2%, while those along the baseline corridors recorded 37% with the control corridors being 33.8%. The improved road seems to have had a positive impact on school enrolment.

The results of the study showed that, on average, the size of households along the baseline corridor (5.1 persons) and control corridor (5.5 persons) were higher than the intervention corridor (4.9 persons). Ama Seiwa a native of Wiamoase had this to say in relation to the number of children she has,

" I have three children who are well spaced and have decided not to give birth any more am on a family planning treatment as the nurses come to educate us on the need to give birth to a few number of children so we can look after them well"

The reduction during the intervention period could be attributed to the fact that those here may have ready access to reproductive care thus possibly limiting the number of births. It is also likely that the economic burden deters them from having so many children. In spite of the variations in the size they were all higher than the national average of 4.4 as recorded in the 2010 Population and Housing Census (GSS, 2012). The trend can be attributed partly to the location of the study area where the dominant farming activities are labour intensive which requires more hands to support the activity. This may have implication for the realization of the MDG 2 target 2 which seeks to increase the attendance rate for girls and boys, as children involved here may miss school on certain days and are likely to drop out and thus perpetuating the poverty cycle eventually. The large household size can be related to the number of children in the 0-14 cohort which recorded higher averages above the national figure.

Table 4.2: Educational Status of Household Heads by Household Size

Education	**Household size**			
	1-5		**6- 10**	
	Control	**Intervention**	**Control**	**Intervention**
	%	%	%	%
No education	38	45	62	55
Primary	52	54	48	46
JHS	56	50	44	50
SHS	48	47	52	53

Source: Field Survey, March 2014.

Households who had no education had larger household sizes of between 6 and 10 while those with some level of education mostly had household sizes of between 1 and 5 as shown on Table 4.2. For example, 62% of household heads along the control corridor had on average between 6-10 members. This, however, has implication on the incomes of the large households which can affect their ability to reduce their poverty level and their ability to access basic services like health and education. The occupational status of households is important as different activities influence the incomes generation and impact positively on wellbeing of the household.

4.1.3 Occupational Status of Households

The agricultural sector remains the dominant activity although other activities were present in the study area. The number of people employed by the agricultural sector during the baseline (89.2%) and along the control communities (76.9%) were higher than along the intervention (63.1%). Agriculture's lead is in line with the national picture, as it employs the highest proportion (56%) of the employed (GSS, 2012), although lower than the corridors under study. This implies that, where there are limited opportunities more people are found in agriculture as asserted by Porter (2002) because they do not have access to other viable opportunities. The engagement of a sizeable number of households in agriculture also indicates that, all things being equal, these household heads will earn some income and food to overcome the poverty and hunger likely to face their households and enable them be in a better position to deal with MDG 1.

The substantial reduction in the percentage involved in agriculture on the intervention corridor can be a result of the presence of other opportunities in other sectors of the economy as indicated in Table 4.1 including informal services sector, formal service sector and industrial sector. A trader at Sampa Market throws light on her change in occupation from agriculture to trading in second hand clothing,

—The road improvement made me to change into this business as l can travel to the other communities to sell both on market and non- market days. It is also easy now to get vehicles as most of the roads are in a good shape now than it used to be years back."

Again at a focus group discussion at Wiamoase, one woman confirmed the change in employment.

"Four women indicated their shift from farming to trading in sachet water both on market and non –market days."

The above quotes go to explain the impact that road improvement have on households and leads itself to diversification which is a hall mark of development. It is possible these women have not left the farming completely but probably made that a minor occupation instead. For example the informal service sector employs 24.3% of the sampled population on the intervention corridor as compared to 5.9% during the baseline period, with the highest proportion occurring on the Agona–Wiamoase corridor (38.8%) which could possibly be related to the number of services, such as health centres, schools and a weekly market. (Escobal and Ponce, 2002; Hine and Riverson, 2001; Lokshin and Yemtsov, 2005; Raballand et al., 2010) which explains the shift from agriculture to non – agricultural employment with improvement on the roads to boost their returns and move them out of poverty and lead to the attainment of the employment MDG. This implies that whenever other viable opportunities exist people, being rational, will move away from agriculture because returns from the activity are depressed as they are enjoyed mainly in subsistence farming. Industrial and formal services were limited on all the corridors as shown on Table 4.1. Those who were unemployment had a higher proportion on the intervention corridor of 5.5% while the control corridor was 3.1% and the baseline had no record of unemployment. The unemployment situation on the corridors could be seasonal, particularly in the dry season, when farming activities are not vibrant. The following section will delve into the results and discussion of other data to address the research questions.

4.2 Economic Activities of Household Heads in the Study Area

The preceding section dealt with the background information on the households, but this section addresses issues concerning the various economic activities employed by households to meet their basic needs. These activities include: farming (agriculture), distributive trading, food selling, vehicle operations, hairdressing, barbering, used cloth sellers (informal services) and those involved in agro processing (small scale industries) and teachers, health workers, extension officers (services formal). As indicated in Table 4.1 agriculture is the lead employer in the study communities which supports the district and national trends.

Males dominate in agriculture on both corridors as indicated in Table 4.3 while women dominated on the intervention corridor under the informal services sector, with Agona–Wiamoase corridor leading in this respect (see Table 4.3). All the intervention corridors with the exception of Old Drobo had women in the lead in the informal service sector. This could be attributed to the fact that most women covered by the survey were primarily farmers but engaged in trading to supplement their incomes. It was evident from the study that 55% of the number unemployed was males on the intervention corridor, thus limiting the available resources to fight poverty and hunger on the corridor, this can therefore delay the achievement of the employment MDG.

The following section delves into the details of the agricultural sector to unveil factors responsible for the production levels and the contact times with extension services, among others, to understand the impact agriculture can have on extreme poverty and hunger in the study communities to eradicate poverty and lead to the realization of the MDG 1 which can have direct, indirect and induced impacts on rural people‘s ability to improve their lives.

Table 4.3 Economic Status and Sex of Household Heads along the Study Corridors

Corridor	Service Formal				Service informal				Industry				Agriculture				Unemployed				TOTAL	
	M		F		M		F		M		F		M		F		M		F		M	F
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%		
Intervention	24	2.4	19	1.9	91	9.2	144	14.6	14	1.4	9	0.9	363	36.9	245	24.9	29	3.0	24	2.4	534	451
Control	2	1.6	1	0.8	14	10.9	5	3.9	2	1.6	0	0	77	59.7	23	17.8	1	0.8	3	2.3	92	32
Intervention Corridors																						
Agona-Wiamoase	12	3.3	14	3.8	50	13.7	91	25.1	10	2.7	2	0.5	79	21.9	72	19.7	22	6.0	12	3.3	171	192
Poano-Ntinanko-Adoowa	9	3.6	3	1.2	22	8.9	28	11.3	3	1.2	2	0.6	103	41.1	70	28.0	3	1.2	6	2.4	140	110
Awisa-Atuna	3	1.8	1	0.9	7	4.6	22	13.8	0	0.0	4	2.8	61	37.6	57	34.9	1	0.9	5	2.8	73	90
Old Drobo-Ponko No.1	0	0.0	2	0.8	15	7.0	9	4.4	2	0.8	2	0.8	121	57.9	49	23.7	5	2.6	2	0.8	142	67
Control Corridors																						
Kokoteasusa-Wiamoase	1	2.7	0	0.0	9	24.3	2	5.4	2	5.4	0	0.0	20	54.1	2	5.4	0	0.0	1	2.7	32	5
Kokosua No. 1&2	1	2.6	1	2.6	2	5.3	3	7.9	0	0.0	0	0.0	19	50.0	9	23.7	0	0.0	2	5.3	23	15
Atuna-Nsuhunu	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	11	84.6	2	15.4	0	0.0	0	0.0	11	2
Aniantetem-Odumase-Amanhyia	0	0.0	0	0.0	3	7.3	0	0.0	0	0.0	0	0.0	27	65.9	10	24.4	1	2.4	0	0.0	31	10

Source: Field Survey, March 2014

Service Formal (includes; teaching, nursing, clerks, extension officers) Service Informal (includes; petty trading, selling clothes, chop bar operators, kenkey sellers) Industry (palm oil processing, gari processing, soap making, gin brewing) Agriculture (subsistence and commercial farming) Unemployed (those in the working age cohort but do not have employment).

4.2.1 Agriculture

Agriculture is important for rural economic development both in terms of the number of people it employs and its contribution to the local economic development. Mabaya (2009) argues that agriculture plays a core role in the total economic growth and development central to the eradication of extreme poverty and hunger (MDG 1). Data from the study revealed crop farming to be the dominant agricultural activity. Crops cultivated were cash and food crops such as cocoa, cashew, maize, cassava and plantain. Cocoa was cultivated in the Ashanti Region while cashew thrives well in the Brong Ahafo region. The high production centres for cocoa were Wiamoase, Adoowa and Ntinanko on the intervention corridor with Amanhyia, Odumase and Kokotesua on the control corridor (see Table 4.5). Cashew production was, however, intensive and on a large scale at Nsosomea, Awisa and Ponko No. 1 on the intervention corridor with Kokosua 1 and 2 along the control corridors as shown in Table 4.5 Maize was also produced on a large scale in the Wenchi Municipality, specifically at Atuna, Awisa and Nsuhunu. The crops in the communities mentioned in the forgoing, are similar to crops cultivated in both regions. It is therefore possible that the soil and other locational factors support such crops. The acreage cultivated and the inputs applied also have implications on the output levels of the major crops along the corridors.

i) Acreage under cultivation of major crops

The study presents a variety in the crops produced on both corridors, with the dominant ones being maize, plantain, cassava, cocoyam, cocoa and cashew. The average land for cultivation of major crops on the control corridors (3.57 ha) was higher in comparison to the intervention corridors (2.87 ha). Although land sizes cultivated were higher on the control corridors, the output levels did not commensurate that, as outputs were rather lower along the control corridors than along the intervention corridors as indicated in Table 4.6. This could be explained by the non-application of fertilizers due to its high cost deterring most farmers from its use and instead concentrate on animal manure which was inadequate for higher outputs. This situation was confirmed at a focus group discussion at Aniatetem by the chief farmer on the third day of the interview,

"There is large spans of land to cultivate crops to feed the nation but the fertilizer is too expensive, the few bought is usually for cocoa production. We mostly use animal waste in place of the fertilizer. This we believe affects the yield at harvest time".

Land used for maize cultivation was slightly lower at 2.35 ha along the intervention corridor as compared to 2.37 ha along the control corridor, but output along the intervention was about two times higher than the control which could be attributed to the use of fertilizer and other chemicals to boost production. Generally, farmers cultivating cash crops had larger land sizes than those cultivating food crops on both corridors. For example, the average land size for the cultivation of cocoa was 3.05 ha and 2.84 ha on the intervention and control corridors respectively as compared to plantain which had 1.22 ha and 0.99 ha on the intervention and control corridors respectively. It can be inferred from the discussion that farmers required larger land for cash crop cultivation than they do for food crops, which could be related to the input requirement and the proceeds from the venture.

The Poana-Ntinaanko-Adoowa corridor (P-N-A) recorded the highest land area among the intervention corridors of 2.7ha on average as compared to Awisa- Atuna corridor recording only 1.59ha. The P-N-A corridor also had the largest land area for cash crop production. For instance, 3.07 ha were used on average for cocoa cultivation as against 0.13 ha for cassava. The reason for the high acreage on the intervention corridors could be attributed to the fact that farmers may have access to other jobs which provides additional income to enable them expand the land under cultivation, purchase fertilizer and other agro-chemical to boost production level as shown in Table 4.6. Further to this could be the increased opportunities for farming activities as well as the increased demand for the produce cultivated on the corridors with the improvement of the road making the corridor easily accessible in the area under study. Production levels are positively related to the type of input used, inputs applied on the study corridors are thus assessed.

ii) Farm Inputs

The inputs used in agricultural activities, to a greater extent, determine the output levels. Based on the data from the study, the major inputs applied by farmers was non-household farm labour as about 70% of the farmers employed this; followed by fertilizer 20% and 10% for weedicides which could be attributed partly to the low acreage cultivated by households as presented in Table 4.4. Other basic inputs like cutlasses, hoes and axes were used by almost every farmer in the study communities covered.

The intervention corridor, however, made use of a variety of farm inputs ranging from non-household labour to fertilizer. From the data, the use of non–household labour, fertilisers and farm machinery came top on the list, followed by household labour and lastly agro–chemicals on the intervention corridor. However, tractor use was only recorded on the Atuna–Awisa corridor, which could be attributed to the flat nature of the land as well as the extent of land to be cultivated, as the farmers utilising the facility indicated a land area of 20 hectares for cashew cultivation. The ratio of households using fertilizer is about 6: 1 for the intervention and control corridor respectively as shown in Table 4.4. High usage by households along the intervention was also related to the location of input shops along the corridors as Agona- Wiamoase and Poano- Ntinanko- Adoowa as those corridors with the shops showed high patronage and usage. The prices were also cheaper than along the control corridor.

Table 4.4 Number of Household Heads who use the various types of farm inputs

Corridor	Non-Household Labour	Weedicides	Fertilizer	Total
Intervention	323	100	114	607
Control	63	23	17	103
Intervention Road Corridors				
Agona-Wiamoase	119	12	41	172
Poano-Ntinanko-Adoowa	107	22	34	164
Awisa-Atuna	56	17	20	93
Old Drobo-Ponko No.1	100	45	9	154
Control Road Corridors				
Kokoteasusa-Wiamoase	15	4	1	20
Kokossua No. 1&2	23	2	2	27
Atuna-Nsuhunu	4	7	11	22
Aniantetem-Odumase-Amanhyia	21	10	3	34

Source: Field Survey, March 2014.

Those on the intervention corridor, as indicated earlier, have access to other opportunities which are likely to increase their disposable incomes and their ability to afford and access other inputs aside non- household labour. Paradoxically, the control corridors made use of household labour extensively. This could be linked to their inability to pay for hired labour with their limited income.

iii) Output Levels of Major Crop

Production level of crops is largely influenced by factors such as the land under cultivation, the inputs applied (chemicals, fertilizer, improved seeds), soil type and rainfall pattern among others. From the survey, major crops cultivated on both corridors included: maize, cashew, cocoa, plantain and cassava. Evidence from the field revealed high agricultural activity on both corridors. The increase in terms of output levels were however substantial along the intervention corridors than the baseline and control corridors. For example, a hectare of land produced 1.87T of maize on the intervention corridor, with the Awisa-Atuna corridor being the highest producer while the same hectare of land on the control corridor produced 1.18T. Whereas the intervention corridor average was higher than the national figure of 1.7 T, the control figure was lower than the national average. The output levels also increased significantly along the intervention corridors than the other corridors. For example, maize recorded a total output of 0.63T, 4.39T and 2.80T for the baseline, intervention and control corridors. The output figures along all the corridors, though encouraging, were all lower than the national figure of 6.0T (see Table 4.6). The intervention corridor in comparison with the baseline and control corridors performed much better which could be attributed to the road improvements which facilitated easy access to input markets and location of input shops along the corridor to boost input use. The increase in cassava was equally extensive over the intervention period, as average change of 58.9% was recorded over the baseline figure (see Table 4.7)

On the other hand, total output of cocoa along the intervention corridor recorded 5.89T which was above the national figure of 1.0T (see Table 4.6). Poano-Ntinanko-Adoowa corridor produced the highest quantity of 5.75T, among the intervention corridors (see Table 4.5), with 4.52T produced along the control corridor, although in terms of land cultivated both corridors were almost the same as indicated in Table 4.5. A further analysis of the field data confirm the increase in output of cocoa as the average change showed an

85.96% increase over the baseline figure. The high output on the intervention corridor is possibly due to the improved accessibility to extension services which was twice a month as compared to once during the baseline period and along the control corridors. Again, the improved road has facilitated easy access to input markets and the location of input shops along the intervention corridor (Wiamoase and Ntinanko) making it easier for farmers to access inputs such as fertilizers to boost productivity and subsequently increasing production levels. The district is also the highest producer of cocoa, which implies that the locational factors could also be relevant. This can be partly attributed to the application of chemical which the farmers on the intervention corridor can afford as explained earlier under the acreage under cultivation. This confirms the chi-square value of 208.4 and a significant probability of 0.000 which shows the level of dependency between the road corridor and the type of crop cultivated is significant.

The productivity levels of cash crops were higher than food crops. For example whereas a hectare of land produced 1.93 T of cocoa, that for cassava per hectare was only 0.50 T on the intervention corridor (see Table 4.6). The application of fertilizer to the cash crops could be a possible reason for the increased output. The reason for this trend could also be the high prices obtained from the sale of the cash crops in comparison with the food crop as a bag (64kg) of cocoa was sold for GH₵ 214 compared to GH₵ 50 for a bag (50kg) of cassava as returns received from the cash crops was higher in comparison with the food crops making it more lucrative. The existence of cocoa buying companies along the corridors probably facilitated its production. For example, at Ntinanko the highest cocoa producer among the intervention corridors and the highest in the Bekwai Municipal, had three cocoa sheds: Olam, Produce Buying Company (PBC) and Akuafo Adamfo, unlike food crops which have to be transported to the weekly markets or it goes to waste. This therefore implies that the nature of the road does affect food crops, leading to reduction in incomes which have implications on poverty and the attainment of the MDG on poverty eradication.

Generally, households along the intervention corridor produced more and also received higher prices for their produce than their counterparts along the control corridors. For example, a 50kg bag of cassava cost about 240% higher on the intervention corridor than on the control corridor as shown on Table 4.8. A female farmer along the Poano- Ntinanko-Adoowa corridor explained the difference in prices of the produce, *"In determining the prices of produce two issues are paramount; the cost of transport and the disposal time of the goods, which favours those of us along improved roads as the frequent passage of vehicles increases the chance of selling off goods early and at competitive prices or taking it to the market to increase the selling price"*

This finding corroborates Gibson and Rozelle's (2002) finding which presented a positive correlation between road access and prices of crops. Gibson and Rozelle's finding seem to attribute the impact solely to road improvements but the present study acknowledges the multiplicity of factors likely to impact on output though not ruling the huge impact from road improvements.

Table 4.5: **Average Farm Sizes, Productivity and Production of Major Crops along Intervention Corridors**

Major Crop	Average Farm Size (Ha)	Productivity (T/Ha)	Total Production (T/Ha)	Quantity sold (T/Ha)	Quantity consumed (T/Ha)	Qty Lost (T/Ha)	Qty for replanting (T/Ha)
Agona-Wiamoase (2.14ha)							
Maize	1.70	1.19	2.02	1.44	0.21	0.15	0.18
Cocoa	2.53	1.57	3.96	3.19	-	-	0.76
Plantain	0.81	0.65	0.55	0.47	0.08	-	-
Cassava	0.64	0.33	0.21	0.14	0.05	-	0.06
Poano-Ntinanko-Adoowa (2.70ha)							
Maize	2.14	1.20	2.57	2.06	0.30	0.11	0.08
Cocoa	3.07	1.87	5.75	5.08	0.09	0.37	0.20
Cashew	0.21	0.40	0.08	0.06	-	-	-
Cassava	0.13	0.22	0.03	0.03	-	-	-
Awisa-Atuna (1.59ha acres)							
Maize	2.29	1.85	4.24	3.71	0.26	0.06	0.21
Cashew	2.57	1.56	4.02	3.85	-	-	-
Plantain	0.53	1.12	0.60	0.53	0.11	-	-
Cassava	0.23	0.41	0.09	0.07	0.01	-	-
Old Drobo-Ponko No.1(2.09ha)							
Maize	1.85	0.95	1.75	1.36	0.10	0.07	0.13
Cocoa	2.47	1.15	2.85	2.51	-	0.13	0.08
Cashew	1.70	1.78	3.03	2.85	-	-	-
Plantain	0.17	0.45	0.08	0.06	-	-	-

Source: Field Survey, March 2014

Table 4.5 continued: Average Farm Sizes, Productivity and Production of Major Crops along Intervention Corridors

Major Crop	Average Farm Size (Ha)	Productivity (T/Ha)	Total Production (T/Ha)	Quantity sold (T/Ha)	Quantity consumed (T/Ha)	Qty Lost (T/Ha)	Qty for replanting (T/Ha)
Aniantetem-Odumase-Amanhyia (2.32ha)							
Maize	1.74	1.20	2.09	1.44	0.23	0.17	0.12
Cocoa	2.55	1.43	3.65	3.18	-	0.35	0.22
Plantain	0.98	1.04	1.01	0.82	0.17	-	-
Cassava	0.53	0.21	0.12	-	0.10	-	-
Kokosua No. 1&2 (4.20ha)							
Maize	1.76	1.15	2.01	1.57	0.19	0.11	0.10
Cassava	1.04	0.35	0.37	0.29	0.07	-	0.01
Cashew	2.48	1.48	3.66	3.44	-	0.27	0.10
Atuna-Nsuhunu (1.69ha)							
Maize	2.20	1.12	2.47	2.25	0.17	0.14	0.10
Beans	0.45	0.66	0.30	0.26	-	-	-
Kokoteasusa-Wiamoase (1.84ha)							
Maize	1.02	1.0	1.02	0.73	0.08	0.13	0.08
Cocoa	1.75	1.23	2.16	1.64	-	0.38	0.14
Plantain	0.58	0.65	0.38	0.35	-	-	-
Cassava	0.52	0.29	0.15	0.09	0.05	-	0.01

Source: Field Survey, March 2014

Table 4.6. Output of Major Crops along various corridors

Corridor	Major Crop	Average Farm Size (Ha)	Productivity/Hectare (T/Ha)	Total Production (T/Ha)
Baseline	Maize	1.25	0.50	0.63
	Cocoa	3.0	1.06	3.18
	Plantain	0.97	1.32	1.28
	Cassava	1.01	0.55	0.56
Intervention	Maize	2.35	1.87	4.39
	Cocoa	3.05	1.93	5.89
	Cashew	2.15	1.77	3.81
	Plantain	1.22	1.07	1.31
	Cassava	0.89	0.50	0.45
Control	Maize	2.37	1.18	2.80
	Cocoa	2.84	1.57	4.52
	Plantain	0.99	1.03	1.02
	Cassava	0.49	0.42	0.21
National	Maize	3.53	1.7	6.0
	Cocoa	2.5	0.4	1.0
	Cashew	2.25	0.8	1.8
	Plantain	1.82	11.0	20.0
	Cassava	3.53	13.8	48.7

Source: Field Survey, March 2014 and Ministry of Food and Agriculture (2011). Facts and Figures. Statistics, Research and Information Directorate (SRID), Accra

With respect to cash crop cultivation, Kokotesua a control community produced the highest quantity of cocoa, Kokosua II recording the highest cashew output on the control corridor while Nsosomea had the highest along the intervention corridor. Maize was however, confined to the Wenchi Municipal with Awisa recording the highest, with Atuna placing second on the intervention corridor and Nsuhunu for the control corridor. This could be attributed to the fact that the farmers were mostly migrants from the northern part of the country where cereal production is the dominant crop cultivated. Another possible reason for the high production of maize could be related to the fact that adequate storage facility was assured. This was because small quantities could be kept in their barns and large ones in a warehouse purposely built for the storage of maize in Awisa by the chief to assist his people, as indicated by the chief linguist as he further explained,

> *"The chief of Awisa has built a warehouse for the bumper harvest time to enable the farmers in the area store crops such as maize to await good prices in the lean season".*

The farmers therefore have good prices for the maize in the lean season to boost their income levels. This therefore serves as savings for them, which support Escobal and

Ponce‘s (2002) view that farmers in Peru considered the road as a temporal measure so reared livestock as a form of savings instead of increasing their consumption. Atuna and Insuhum were the only communities where beans production was recorded although not in large quantities, as it was meant purposely for consumption. In the Peru study, farmers envisaged the road improvements to be temporal which made them invest in livestock, but the present study farmers did not see the road investment as such but rather perceived it to be permanent to aid their farm activities.

Food crops

Food crops production was done on subsistence level where the household consumes part with surpluses sold to purchase other items to complement the food produce. Crops under this category include: plantain, cassava, yam, tomatoes, pepper and cocoyam. Interestingly, pepper, plantain and cassava were found in large volumes on the intervention corridor than on the control corridor. A similar study by Omamo (1998) found that poor road access influences cropping choices as was the case in his study. This could be attributed to the fragile nature of these crops such that if they are delayed in reaching the market, post-harvest losses can increase. The high output levels on the intervention corridors can also be attributed to the use of fertilisers and agro–chemicals as this was limited or absent on the control corridors. Again inferring from Table 4.7, the output levels along the intervention were very significant as maize recorded a percentage change of 273 percent at the intervention period over the baseline. Not only was the output significant, the percentage change in price as indicated in Table 4.8 for maize was 194.12 percent over the same period. This implies that the road investment have had a good impact on households which has the potential to increase their incomes and get them out of poverty and lead to the achievement of the MDG 1. Again, the high land area under cultivation on the intervention corridor could be related to the easy access due to availability of vehicles to convey their goods to the markets. Based on the data collected from the field, the total quantities of maize sold were higher on Awisa - Atuna corridor than on the Agona- Wiamoase corridor as shown in Table 4.5.

Table 4.7: Percentage Change in Output Levels (Tonnes) by Corridors

Crops	Baseline	Intervention	Change	% Change	Control	Change	% Change	Change^{-}	% Change^{-}
Maize	0.63	2.35	1.72	273.02	2.37	-0.02	-0.84	1.7	272.18
Cocoa	3.18	3.05	-0.13	-4.09	2.84	0.21	7.39	0.08	3.30
Plantain	1.28	1.22	-0.06	-4.69	0.99	0.23	23.23	0.17	18.54
Cassava	0.56	0.89	0.33	58.93	0.49	0.4	81.63	0.73	140.56
Average	1.41	1.88	0.47	80.79	1.67	0.21	27.85	0.67	108.65

Source: Field Survey, March 2014

Table 4.8: Percentage Change in Prices of Major Crops

Crops	Baseline	Intervention	Change	% Change	Control	Change	% Change	Change^{-}	% Change^{-}
Maize	34.68	102	67.32	194.12	60	42	70	54.66	132.06
Cocoa	161.84	214	52.16	32.23	203	11	5.4	31.58	18.82
Cashew	115.6	122	6.4	5.54	110	+12	10.91	9.2	8.23
Plantain	4.34	7.18	2.84	65.44	6.12	1.06	17.32	1.95	41.38
Cassava	8.67	50.24	41.57	479.47	17.3	32.94	190.41	37.26	334.94
X	**65.03**	**99.08**	**34.06**	**155.36**	**79.28**	**19.80**	**24.98**	**26.93**	**90.17**

Source: Field Survey, March 2014. * Baseline values were calculated using CPI Formula, detailed found in Appendix 4.1.

Price of Commodities

Prices of produce were higher on the intervention corridor in comparison with the control and baseline corridors. For example, the 64kg bag of cocoa was sold at only GH ₵ 161.84 in current terms at the baseline period, GH ₵214 on the intervention corridor and sold at GH ₵203 on the control corridor. The increase in price showed an average change of 70 percent over the control corridor price as indicated in Table 4.8. This phenomenon was quite surprising for cocoa because the buying companies were coming in with their trucks to convey the cocoa irrespective of the road condition, but the differences between the farm gate price and the market price accrue to the agents for their services. A cocoa agent Pope at Aniatetem explained the difference between the price they buy at the farm gate and the market price,

"As agent representing a company and gather for the company but you pay a lower price if you have to travel around some villages as your transport cost need to be catered for by yourself and not the company. Where there are numerous agents competing for the cocoa beans especially along the improved corridors you have to pay more"

An observation made was that the prices of foodstuffs were higher on the intervention corridors but lower on the control corridor. The 100kg maize bag cost GH ₵102 on the intervention corridor but was sold at only GH₵ 60 on the control corridor.

From Table 4.8, it can be see that the continuous increase in the price of maize accordingly showed an average change of 194.12 % between the baseline cost and intervention period. The low prices on both the baseline and control corridors could be due to the nonavailability of vehicles to transport the farm produce to the weekly market to sell at competitive prices. On the contrary, farmers along the control corridor preferred to sell at the farm gate to avoid transport cost, this was clearly shown in Table 4.24 where 82.50 percent of the total produced were sold on the farm as compared to only 62.89 percent on the latter corridor.

Another reason could be the convenience, as mentioned at the focus group discussion, and the burden of transport which falls on the middlemen if sold at the farm gate. Other studies supporting this view including one in Uganda where Fafchamps and Vegas Hill (2005) found that small holder coffee producers sell at the farm gate as market transaction cost was considered to be higher than the competitive price at the market. The middlemen buy small quantities from several farmers and transport to the weekly or urban markets. A middleman Akosua Manu had this to say in relation to foodstuff transportation:

> *"I buy plantain from three nearby communities at lower prices and bring in transport to carry all also at reduced price from the vehicle operator as he usually carts my goods from different places to the urban markets. I earn more than farmers who take their goods to the market from here".*

From the presentation, it can be inferred that the middlemen will have a higher margin after sales as the price for the goods bought at the farm gate is lower, added to the transaction cost less the market price will leave with reasonable returns. This means that the middlemen are better off than the farmers who have invested so much in the production. The farmers also indicated that it was cost effective to sell to middlemen, when their produce is on a small scale than taking them to the market. On the other hand, where they have volumes to sell or can haul to the market with other farmers, they do so to reduce the cost of transport. This implies that less income will be derived from the farm sales on the control corridor which may affect their poverty situation, but households are compensated by the high consumption of food stuffs produced. The low incomes will perpetuate their poor state which might hinder the achievement of most of the MDG, as money will be required to access services, such as health and education.

Proportion of crops consumed

Proportion of food consumed on the intervention corridor was lower for all food crops produced as indicated in Table 4.5. The road improvement could be a reason as the corridor was exposed to other foodstuffs, as evident in the operations of cooked food varieties (e.g roasted plantain, fried yam, chop bars), aside the farm produce which is likely to be of value in terms of the dietary needs of the households. A trader at Atwetweso along the Poano-Ntinanko- Adoowa Corridor explained the diversity in foods consumed by her household, *"I get cassava, plantain, cocoyam from my farm and buy rice on market days from the Bekwai market, l also buy fish and meat from Ntinanko some evenings to prepare my meals. My children buy food in Ntinanko when they attend school daily."*

This will help boost their consumption and address their hunger needs; thus improving their welfare to an extent which eventually helps in the realization of the MDG on the extreme poverty and hunger.

Proportion of Crops Lost

Different factors were responsible for the lost of crops in the study area. From the crops captured, maize had the highest loss on the control corridor of 6.9% of the quantity produced as compared to 1.2% on the intervention corridor. The control corridor‘s losses could be explained from the inaccessibility point of view as 38.5% of the households sampled mentioned this as the cause for their produce loss with the intervention recording only 10.6% from the same problem. Nsuhunu was the worse affected community along the control corridor, as 52% had problems with inaccessibility and lost 0.14 T (see Table 4.5) of the quantity produced. An old lady living at Odumase threw light on her poverty situation during the survey,

"I used to plant a lot of vegetables (tomatoes, pepper, garden eggs and cabbage), but have reduce the quantities due its nature, because if the women do not come on market days to purchase the harvested produce go to waste".

This scenario does perpetuate poverty and will hinder the achievement of the first MDG. The intervention corridor recorded the highest lost on the Old–Drobo-Ponko No. 1 corridor of 41.2% with Agona-Wiamoase corridor presenting the least of 20.2%. The frequent assistance given through extension contacts could be a possible reason for the difference on the latter corridor as farmers had an average of two contacts per month as opposed to a frequency of once a month on the former corridor.

With respect to proportion left for replanting the following season, this applied to only maize and beans, but for the purpose of the major crops covered only maize will be considered. This is because it is the only crop that some of its output can be saved for replanting.

Proportion of maize left for replanting the following year, was lower on the control corridor; 10.4% compared to 12.8% of the quantity produced on the intervention corridor. The quantity left for replanting is a means of sustaining households' income over the long period which has the potential to reduce the poverty state of households on both corridors and lead to the attainment of the MDG on employment and poverty.

iv) Causes of Produce Loss along the study corridors

The data set presents diverse views with regard to the common causes of post-harvest losses along the different corridors. These include: pest and diseases, poor weather condition, lack of transport services, inaccessible roads, inadequate storage facilities, and distant markets; among others. For the baseline period, inaccessible roads, limited transport services, distant markets, and poor weather were the dominant causes of postharvest losses; as about 56% mentioned inaccessibility of the road to be the major cause of post-harvest losses; while only 22% did so on the intervention corridor (see Table 4.9). The high percentage on the intervention corridor could be the result of the nonmaintenance of some intervention corridors like the Atuna-Awisa corridor and portions of the Poano-Ntinanko-Adoowa corridor. However, about 48.2% of farmers on the control corridor had difficulties related to the road. The one farmer Kokotesua lamented over post harvest losses which he attributed to the poor state of their road,

"The land here is fertile and can produce to feed the whole of Ashanti Region or the Northern Sector, but there is no point in producing if vehicles cannot come to cart the goods to the market centres on this poor road".

This phenomena only keep these people in poverty and hunger as this limits their income source to cater for the household and retard the MDGs realisation. The dominant cause of produce loss along the Intervention corridor was pest and disease as well as poor weather condition as mentioned by the inhabitants along the corridors.

Table 4.9. Factors responsible for Post-Harvest Losses on the Corridors

Factors responsible for Post-Harvest Loss	Baseline %	Control %	Intervention %
Inaccessible road at harvest time	56	48.2	22
Absence of transport services	38.6	33.1	0.7
Weather condition	16.2	30.6	29.1
Pest and Diseases	28.8	30.4	20.6
Inadequate storage facilities	23.7	25.9	0.4

Source: Field Survey, March 2014.

From the discussion, it can be deduced that the transport related factors were limited, as other factors were largely responsible for losses along the intervention corridor but the reverse is true for the control corridor where inaccessibility was the major cause of post harvest losses when foodstuff is concerned along the corridors. Having looked at the agricultural practices, the next section explores the informal service sector of the study communities.

4.2.2 Informal Service Sector

This sector comprises different categories of services including: petty trading, distributive trading, ‗chop bar' operators, food sellers, and transport operators; among others. The sector is the second most important after agriculture and employs 24% of the sampled population on the intervention corridor and 15% on the control corridor. Although it engages fewer people, returns from the activity was the highest along the intervention corridor. Most of the activities in the sector engage women, as shown on Table 4.3 where women out numbered men on the intervention corridor. The women probably engage in these activities to supplement the household income, as mentioned at the focus group discussions. Akua Atta a chop bar operator at Wiamoase in the Sekyere South District explained why she had undertaken this economic activity,

"From 2008 three of my children entered tertiary education making the household expenditure very high as such only the farming could not sustain us. Fortunately, the number of people had increase due to the road improvement, as many jobs are available for skilled personel, so l decided to find a place around the car station to operate this business to add to the farming income so our children can go to school".

The informal service activity was more vibrant along treated road corridors, as it was mostly seen in communities like Wiamoase, Awisa, and Old–Drobo. The number of women equally outnumbered the men on all the intervention corridors. The only exception was recorded along the Old–Drobo–Ponko 1 corridor where the opposite happened. This may be attributed to proximity to La Cote d' Ivoire border which may attract the women across to possibly earn higher incomes from their agricultural activities because of the production of cocoa. Formal services is next presented to better place all the available employment avenues for holistic development of the study communities.

4.2.3 Formal Services

Services in this category include: teaching, health work, agricultural extension services, and secretarial jobs; to mention a few. Owing to the nature of the study area, these activities were limited. In terms of employment the sector placed third on the intervention corridor employing 4% of the sampled labour whereas only 2% was recorded on the control corridor. Communities which had these services included Wiamoase, Ntinanko, Awisa and Old Drobo. Wiamoase had the highest score in terms of formal employees like teachers, health workers and extension officers. The reason could be due to the presence of the two health facilities which will be deliberated upon subsequently in this study. The presence of the road has attracted an increase in the number of facilities such as schools and upgrading of the SDA health centre into a hospital. Most of the workers reside and work in the communities, though some reside at different places and work at other locations. For example, about 80% of the teachers at Bipoa, a community along the Agona-Wiamoase corridor, reside at Agona and travel daily to work elsewhere. This is made possible because of the availability and reliability of transport services along the corridor. Small scale industrial activities were also covered as they have implication for the welfare of the households along both corridors.

4.2.4 Small Scale Industries

Industrial activity which adds value is important to the local economic development. Small scale industrial activities were also covered in the study communities and they include palm oil extraction, gari processing and local gin distilling. Wiamoase, Ntinanko, Awisa, and Bipoa were the major areas where these industries were undertaken. For instance, there were two oil palm mills at Ntinanko, four corn mills at Wiamoase, two dry gin distilling also at Wiamoase. There were a few carpentry shops in Wiamoase, Ntinanko and Awisa. Kwaku a carpenter at Bipoa has a lucrative venture at the survey period,

"I have a farm at Kokotesua but the nature of the road deters me from staying there to engage in the farming activity, so l decided to change to this job because the road in Bipoa is in a good shape so l get a lot of customers from Agona and its environs. If they do not come the availability of vehicles make it possible to convey the goods. I also get enough to look after my household and pay the labourers on my farm presently."

The location of all these activities along the intervention corridors could be attributed partly to the presence of the road to facilitate easy access to transport for haulage of industrial outputs to outside locations for sale. Another reason could be the proximity to the source of raw materials which are bulky.

4.3 Income and Economic Activities

All corridors had variety in the employment structure from agriculture to informal services but field evidence revealed that, although agriculture employed the highest number of households it was the least lucrative comparing the average incomes of the sectors of the local economy along the intervention corridor. Conversely, agriculture had the highest income on the control corridor, as indicated in Table 4.10.

Table 4.10: Average Income by Economic Sectors along Study Corridors

CORRIDOR	Agriculture/Farming		Service Informal		Service Formal		Industry	
	GHS	%	GHS	%	GHS	%	GHS	%
Intervention	1,034.95	18.7	1,803.8	32.51	1,133.45	20.43	1,575.6	28.4
Control	1,789.34	36.1	1,261.13	25.5	901.04	18.2	1,002.24	20.2
Intervention Corridors								
Agona-Wiamoase	1,720.5	64	369.14	13.7	231.38	8.6	366.67	13.6
Poano-Ntinanko-Adoowa	103	5.3	45	2.4	451	23.3	1332.5	69
Awisa-Atuna	124	17.4	132	18.5	383	53.6	75	10.5
Old Drobo-Ponko No.1	1,786.83	47.3	143	3.8	730	19.3	1,115	29.5
Control Corridors								
Kokoteasusa-Wiamoase	1,603	50.1	54.55	1.7	-	-	1,540	48.2
Kokosua No. 1&2	1,628.33	95.8	72	4.2	-		-	
Atuna-Nsuhunu	15.40	100	-				-	
Aniantetem-OdumaseAmanhyia	85.14	28.7	211.94	71.3	-		-	

Source: Field Survey, March 2014

The most lucrative venture, however, on the intervention corridor was the informal service sector which had the highest mean per capita monthly income of GHS 1,803.8, although in terms of employment it came second after agriculture (see Table 4.10). This finding supports previous studies (Gachassin, Najman and Raballand, 2010; Escobal and Ponce, 2002; Hine and Riverson, 2001; Lokshin and Yemtsov, 2005). These authors view the increase in non-farm activities to be more than the increase in agriculture productivity on the improved corridors in their respective studies. Although the Agona–Wiamoase corridor had a variety of activities in the informal services sector, it had the highest income contribution from agriculture; being the highest with the informal services being the second contributor in the local economy. This implies that majority of households still depend on agriculture for their livelihood though other opportunities exist. It is also possible that some informal activities are undertaken during the lean season or as a secondary occupation job to supplement agriculture income. The engagement of households in the informal services could also be related to the demand for the services on account of the high concentration of population along the corridor.

Another reason could be the existence of diverse services such as health facilities in Wiamoase as well as schools, a lorry station and a weekly market. The opposite picture was seen on the control corridors where limited demand led to limited supply of informal services. The limitation of other opportunities along the corridor implies that households are locked in farming, which was the highest in terms of the income derived from the activity - GHS 1,789.34 as compared to GHs 1,034.95 from agriculture on the intervention corridor. Higher incomes from agricultural activity on the control corridor could be from the bulk sales of their farm produce at the farm gate to middlemen who bore the transport cost to the urban markets and the weekly markets. This notwithstanding, income from the informal services was higher than agriculture.

With the exception of agriculture all the other sectors performed better in terms of the incomes on the intervention corridor whereas the reverse was the situation on the control corridor. This implies that where there are other opportunities people, being rational, will opt for areas with higher returns as seen in this study. Households on the intervention corridor therefore have better welfare in terms of their disposal income and potentially better placed to deal with poverty than those on the control corridor.

From the foregoing, it can be said that the earlier authors' failure to disaggregate data on informal service activities as was the case in the present study could be responsible for the impact found in the informal service sector, as further disaggregation into specific corridors presented deferring views. As agricultural employment was seen to contribute the highest incomes on the individual intervention corridors as shown on Table 4.10. The incomes accruing to households enable them to better deal with their needs and hence, the following section tries to relate the income from the various activities engaged in with expenditure.

4.4 Household Income and Expenditure

Households engage themselves in diverse economic activities with the hope of benefitting financially to address their enormous needs. This section therefore tries to explore this in the study communities.

Table 4.11: Average Household Monthly Income and Expenditure

Corridor	**Average Income (GHS)**	**Average Expenditure (GHS)**
Intervention (Overall average)	303.25	402.1135
Control (Overall average)	229.57	435.221
Intervention Corridors		
Agona-Wiamoase	350.50	374.201
Poano-Ntinanko-Adoowa	279.78	494.79
Awisa-Atuna	243	415.97
Old Drobo-Ponko No.1	325	580.76
Control Corridors		
Kokoteasusa-Wiamoase	517	337.36
Kokosua No. 1&2	199.50	561.17
Atuna-Nsuhunu	90	263.29
Aniantetem-Odumase-Amanhyia	200.3	365.52

Source: Field Survey, March 2014

4.4.1 Household Incomes

A household's income has implications for its wellbeing. In this study, the major sources of incomes included farming activities, trading and marketing, small scale industrial activities, food processing, transportation, teaching as well as health services. Households on both corridors depended on the stated activities with the only difference being the scale of operations which affects the returns therefrom. For example, farming activities were undertaken more extensively on the control corridor than on the intervention corridors as indicated earlier in Table 4.1 where a large proportion of households depended on farming activities for their incomes. Maame Pokua a farmer indicated her sources of income at Ponko 1,

"l farm during the farming season which earns me income, but aside this my son in Kumasi also remit me every other month, so do my two daughters at Sampa. The improvement in the road has brought another source from selling sachet water from mid day to the evenings on market days."

From the above quote it can be inferred that there could be diverse income sources for households although it is atimes difficult to capture in surveys.

As can be seen from Table 4.11, average monthly income ranged from GH ₵229.57 on the control corridor to GH ₵303.25 on the intervention corridor. In comparison with average household incomes of Sekyere South District of GH₵160.23 (MTDP, 2013), meant the study corridors are better off, although in relation to their expenditure the difference is not substantial as will be revealed in the next section. With respect to the intervention corridor the range was from GH₵ 243 on the Awisa-Atuna corridor in the Brong Ahafo region to GH₵ 350 on the Agona-Wiamoase corridor in the Ashanti region. The diversity in employment sources on the Agona-Wiamoase corridor especially in the formal, informal and industrial sectors could be cited as a possible reason, which could be partly due to the road improvements; thus, opening up these opportunities aside farming. Though the range seems wide, the distribution was more equitably distributed on the intervention than the control as those with incomes of between GH₵ 0-300 formed 34.8% as compared to 66.8% on the control corridors as indicated on Table 4.12. This trend was confirmed by a Gini coefficient of 1: 0.48 and 1: 0.64 for the intervention and control corridors respectively (see Appendix 4.3). It seems like the road improvement not only boosted households' income but enhanced equity than the case along the control. At Kokotesua the chief during the focus group discussion revealed that roads can boost income sources,

―*When you go to urban areas you see and feel that everyone has some money but the situation is different here, some of us are happy only during harvest time, as we have money. Those in Wiamoase have other opportunities which could be the presence of the roads as during non- harvest time they can travel easily to other locations to seek for jobs to earn incomes".*

Table 4.12. Income Distribution along the sampled corridors

Corridor	0-300 (GH₵)		301-500 (GH ₵)		501+ (GH₵)		TOTAL	
	Freq	%	Freq	%	Freq	%	Freq	%
Intervention	344	34.8	262	26.6	379	38.6	985	100
Control	83	66.8	26	20.9	15	12.3	124	100
Intervention Corridors								
Agona-Wiamoase	137	38	48	13	178	49	363	100
Poano-Ntinanko-Adoowa	106	42.1	25	9.9	119	48.0	250	100
Awisa-Atuna	47	29.3	96	58.6	20	12.1	163	100
Old Drobo-Ponko No.1	62	29.8	53	25	94	45.2	209	100
Control Corridors								
Kokoteasusa-Wiamoase	21	56.3	4	10.6	12	33.1	37	100
Kokosua No. 1&2	28	75	6	15.5	3	9.5	37	100
Atuna-Nsuhunu	12	100	0	0	0	0	12	100
Aniantetem-Odumase-Amanhyia	26	67.8	11	28.3	1	3.9	38	100

Source: Field Survey, March 2014.

Mean monthly incomes on the control corridor also range from GH₵ 90 on the Atuna–Nsuhunu corridor in the Brong Ahafo region to GH₵ 517 on the Wiamoase–Kokotesua corridor in the Ashanti Region. In terms of the returns, this difference could be related partially to the crops cultivated such as cocoa which had higher value and quantity produced and returns from sales were also higher than from maize which was the predominant crop in the Brong Ahafo Region from the sampled population covered. This could be the reason for the difference in incomes accruing to the respective households. Consequently, households in the Ashanti region are in a better position to meet their basic needs than their counterparts in the former region. Calculation of the minimum daily wage on both corridors also indicates that those on the intervention corridor had higher daily wage of GH ₵10 while those on the control corridor had GH ₵7. This implies that those along the intervention corridor would have much more to spend than their counterparts in meeting their essential needs which have the capability to enhance their welfare and lead to the realization of the MDG on poverty which directly affect all the other MDGs.

4.4.2 Household Expenditure

Based on the data collected, the household expenditure items included food, education, farm inputs, transportation, and health. Average household expenditure ranged from GH₵ 402.11 to GH ₵435.22 on the intervention and control corridors respectively. With respect to the individual items, the intervention corridors had relatively higher monthly expenditure than those along the control corridors. For instance, the Old Drobo–Ponko 1 corridor on the intervention corridor in the Jaman North District had the highest expenditure of GH ₵580.76 per household with Agona-Wiamoase in the Sekyere South District having GH ₵374.21 per household (see Table 4.11). The situation on the control corridor presented Kokosua 1 and 2 as having the highest expenditure per household of GH ₵561.16. Araba a trader explained the consumption situation at Old Drobo in the Jaman North District,

"The prices of manufactured items are very expensive in the community as most of the things are gotten from Sunyani, so people pay more than their counterparts in the urban areas, the transport cost I think is a key factor with regard to the cost of the items here.
The situation is worse on the control corridor where my sister lives".

Average household expenditure on the Atuna–Nsuhunu corridor was GH₵ 263.29. The high expenditure in the Jaman North District could be related to their proximity to the La

Cote d'Ivoire border, where cost of living is high, because of the increased demand from both sides of the border.

The mean household expenditure on the individual items ranges from GH₵ 19.03 to GH₵ 233.38 for water and farm inputs respectively as indicated on Table 4.13 on the intervention corridor. The control corridor followed a similar trend as the intervention corridor with an average household expenditure on water of GH₵ 6.78 and GH₵ 327.02 on farm inputs. Although the expenditure patterns are similar, the expenditure on farm inputs on the control corridor was substantial which could affect their incomes as limited incomes would be available, to be utilized for the other needs of the households after purchasing farm inputs. Agya Amankwa a cocoa farmer at Aniatetem in the Bekwai Municipality commented on the expenditure pattern of the households,

"The inputs for farming is expensive especially the fertilizers and because we are not able to buy in bulk it affect the price coupled with the transport cost to transport from the urban areas to the rural area, the nature of the road more than double the transport cost".

The higher expenditure on farm inputs on the control could be attributed to the transport cost as well as the extensive engagement of households in farming activities as opposed to the intervention corridor where expenditure on business activity had a higher figure of GH₵ 112.85 per household compared to GH ₵50.50 per household on the control corridor. This figure could also represent the expenditure on distributive trading to purchase the needed items to facilitate the venture.

Table 4.13. Average Expenditure on selected items by study corridors

Corridor/Item	Control corridors (GH₵)	Intervention corridors (GH₵)
Expenditure on food	136.14	167.29
Education	128.09	124.37

Electricity	N/A	20.90
Farm inputs	327.02	233.38
Rent	44.89	70.71
Funeral/Social events	42.40	34.44
Fuel	33.15	22.37
Water	6.7	19.03
Transportation	43.57	39.67
Health	38.87	29.49
Capital items	28.25	60.6
Business activity	50.50	112.85

Source: Field Survey, March 2014.

Interestingly, households on both corridors had a similar expenditure pattern from the first to fourth items being farm inputs, food, education and business activity. Table 4.13 presents the items critical for the realization of the MDGs as access and consumption of these services can break poor people‘s vicious poverty cycle and enhance their well being. Expenditure on food was particularly worrying as it formed 13% of the control expenditure, which does not include foodstuff from their farms. Maame Fosua the Odo na Aye leader at Kokotesua lamented on the amounts spent on food by the control corridor,

"We produce all our foodstuff but spend a lot of money to purchase supplementary items like fish, meat, salt and rice. The price is much higher if bought within the settlement, this drain our income and leave us with just little to address other needs."

This implies that if these households were to spend on foodstuffs then almost half of their income would be used on food which will then perpetuate their poverty level and make them worse off. Again, about 55% of their incomes was spent on education with the bulk of the educational expenditure being on books, feeding and uniforms, among other items, at the basic level. The main cost component at the SHS level was for tuition and complementary items. This notwithstanding, parents were willing to send their wards to school no matter the cost. However, the cost at the basic level was bearable as more than 95% of the schools covered in the study were public schools where the operations of the capitation and school feeding programmes were effective; thus reducing parents‘ expenditure on education at the basic level. A transport operator revealed at Awisa, that though expenditure on education was high he want to send his children to school, *"Though the cost of educating children is high l want my children to have skills to get better jobs and not also become drivers so am determined to spend money on their secondary and tertiary education, though l need to forfeit other essentials"*

Transport expenditure placed fifth and formed 4.38% of the expenditure on the control corridor. Transport expenditure came seventh on the intervention corridor and slightly lower as it formed 4.24% of households' expenditure on the intervention corridor. This implies that fares were relatively higher on the control corridor due to the limited available transport services and hence thus households spent more on transport activities from their limited incomes. The reverse was the situation on the intervention corridor where due to the improvement on the road, more vehicles ply the corridor making fares competitive for both passengers and goods.

To summarize, the income and expenditure patterns on both corridors reveal a similar pattern. As income increases expenditure also increases as well but the expenditure was substantial on the control corridor as indicated in Table 4.11. A further testing revealed a positive linear correlation between income and expenditure, with a coefficient of 0.583, which confirms the revealed pattern between income and expenditure that is as income increases expenditure also increases. Expenditure figures present a heavy burden on households on the control corridor than the intervention corridor, as control corridors require about twice their income to cater for themselves while those on the intervention require only half that amount, to address the services critical for the achievement of the MDGs.

4.5 Access to Basic Facilities in the Study Area

Facilities accessed by communities in the study were reviewed because consumption of these facilities has the potential to improve the welfare of rural poor people which will improve the human resource base and enhance their productivity and the eventual realization of the MDG on education and health. From the survey, it was revealed that the major facilities accessed by the inhabitants were education, health facilities, markets, and water. In rural areas where the facility could be limited or absent, transport availability and affordability is crucial for the effective utilization of basic services. The educational facilities are first assessed to better place them within the context of the realization of the

MDG 2.

4.5.1 Educational Facilities

The World Bank (1993) has indicated that primary education is the single largest contributor to growth as it has the ability to lift a country out of poverty. This implies that investment in basic education can propel development to have diverse impacts on the poor, such as an increase in productivity of the labour force which can enhance their earning power to get them out of poverty.

i) Number of children in school

From the survey, it was revealed that most households had children in school. On average about 3 children from every household were in school along the intervention corridor with 2 on the control corridors. Out of a total number of 548 and 139 (see Table 4.17) school going children, 51% and 44.6% of those along the intervention and control corridors respectively were in primary school. By implication if these pupils are given the needed tuition then they can improve themselves, as they will be able to read and write in the short term. In the long term, they can have good jobs and contribute to growth of the rural area and Ghana at large and move from their present state, confirming the view of the World Bank (1993). This finding on high enrolment on improved corridors is supported by Bhatta (2004) in an Ethiopian study where road improvements encouraged households to enrol their children in school. The low number of children recorded on the control corridor could be as a result of the absence of basic schools within the control communities, with the exception of Kokosua 1 and 2 as well as Amanhyia which had schools. The school at Amanhyia was only a lower primary, which starts from primary one to three, after which the children had to walk 3.5km to Sekyikrom for upper primary and further to Safokrom a distance of 3km from Sekyikrom to attend JHS. Most households mentioned the dangers involved with leaving the children to walk even in the company of older children. Girls education was the most affected as parents make them start school later in age than their counterparts on the intervention corridors as reported by a teacher at Ntinanko an intervention corridor:

‗Children of school going age on the improved roads usually start school earlier than those who come from the remote or poor access roads. The start age for girls are particularly higher than boys"

Ajara a parent on the control corridor had this to add to the above in relation to school children's education:

„l only allow my daughters to start school from age 10 when l feel it is safe for them to walk in the company of other children from this village to school in the other village".

Delayed and non-attendance is detrimental as the poverty levels of such households will be perpetuated to worsen their plight, thus retarding the achievement of the goal on primary education for all by 2015. Children on the control corridors had particular challenges with respect to their journey to school. One head teacher at Bipoa along the intervention corridor had this to say:

— From lower primary some of the pupils living in poor access areas travel daily to the Bipoa LA School on daily basis but come to live with friends or family in Bipoa when they get to JHS to enable them learn and attend preps organised by the school from 4- 7pm."

He explained further that this model was used because some of the control communities, do not have access to JHS in their respective communities. They are therefore compelled to relocate to the intervention corridors to have access to JHS education. This was probably the case because they need to prepare for their first external examination to enable them move up the educational ladder. The quality of teaching resources confirmed at two focus group discussions and summarised as follows:

"Since the road improvements teachers posted here stay longer in the community or stay in the next community and travel to school as taxis are always on the road. Our children are given the government books in school and given food in school".

It is possible that the quality tuition received from qualified teachers, regular supply of teaching materials and regular attendance of teachers at the JHS level on the intervention corridors are all contributing factors to the performance of students in the BECE examination.

Table 4.14. B.E.C.E Performance (Pass Rate)

District	2007	2008	2009	2011

Wenchi	-	54.7	46.3	-
Bekwai	65.3	77.6	85.1	-
Jaman North	86.51	78.17	75.24	-
Sekyere South	68.8	67.3	71.1	-
National	-	-	62.17	59.45

Source: NDPC, 2013.

The district figures are shown in Table 4.14, where Sekyere South District performance in the B.E.C.E revealed a mix picture as 68.8% passed in 2007 which went up to 71.1% in 2009, though there was a slight drop in 2008 figure. However, the performance was encouraging, in comparison with the national figure of 62.17% (NDPC, 2013). This also attests to the quality tuition and resources received in the study area. Wenchi Municipal was the only district among the study districts whose performance was below the national average for 2009 academic year also indicated Table 4.14. It is therefore hoped that the various measures will be applied to move the performance up. This was confirmed by Kofi Mensah a parent at Adoowa in the Bekwai Municipality during a FGD who indicated that;

—The children in the community are now doing well in school than it used to be some ten years ago, where due to the distant locations of schools, they attend school once or twice a week but now they go to school everyday and are serious with their learning, which is also a factor in their high performance recently".

From the forgoing, it can be referred that the quality of tuition on the intervention corridors may be partly responsible for the performance of the children in the respective districts. Few children were in SHS and where the intervention corridor recorded 36 and 15 for the control corridor. However, a higher number of children in SHS on the intervention corridors could be attributed to the easy access to outside locations as all the SHS were located outside the corridors surveyed. Again, it is also possible that due to households improved welfare in terms of income (GH₵ 303 per month per household or per capita,on the intervention corridor as compared to GHS 229 on the control corridors) made it possible to afford the high SHS expenditure which is of about GH₵ 700 (school fees and other related expenditure) per term of (3 months). About 3% of households along the intervention corridor had children in tertiary education, no figure was however recorded from households on the control corridor which was confirmed at the focus group discussions. This could be related to the non availability of schools coupled with other limitations compel the children to have limited access and likely to drop out of school. It is also possible that they get socialised into agriculture which prevent them from climbing up the educational ladder. This phenomenon could be related to the low attendance of 3 days on average every week and the likely low completion rate as indicated by some head teachers later in the study, makes it impossible to further their education but turn to agriculture to perpetuate the household poverty which hinders the achievement of the MDG on education. Quality services have a positive impact on the children along the intervention corridor, and they have the potential for the achievement of the MDG on education as access only cannot enhance the productivity of the pupils. From the study it was found that access and quality tuition were higher along the intervention corridor and this was found to boost enrolment which affects participation in education.

ii) School Participation Rate on the Corridors

Evidence from the field shows that the school participation rate along the intervention corridors was higher than those on the control corridors. For example, the primary participation rate was 65.3% as compared to 32% along the control corridors. Though the intervention corridor figure was higher than the control corridor both were lower than the national figure of 105% (NDPC, 2014). The higher level of participation along the intervention corridors could be attributed to the quality of tuition and teaching resources as indicated in the foregoing. The safer environment enjoyed along the improved corridors could also be a factor. The age participation of the school children however varied as shown on Table 4.16. Teacher Kojo, a teacher at LA Primary School at Nsosomea added that,

"The improvement in roads has helped as the safe environment make children walk by the road side to school unlike previously when parents or older siblings had to accompany them which reduce attendance, but the escort still exist along the control corridor which explains the low participation. This also affect the starting age between the areas of improvement as against the control, making the starting age to be higher for control children".

Table 4.15. School Participation Rate by road corridors and ages

Corridor	Kindergarten	Primary	JHS	SHS
Intervention	42.5	65.3	58.3	34.8
Control	25.5	32.0	24.3	18.3
Intervention Corridors				

Agona-Wiamoase	37.3	63.3	63.5	8.6
Poano-Ntinanko-Adoowa	51.4	71.4	61.2	21.7
Awisa-Atuna	15.1	69.1	53.3	14.6
Old Drobo-Ponko No.1	32.2	58.9	51.1	33.3
Control Corridors				
Kokoteasusa-Wiamoase	13.0	28.6	29.1	13
Kokosua No. 1&2	27.2	48.7	40.0	40.4
Atuna-Nsuhunu	24.0	15.6	21.1	-
Aniantetem-Odumase-Amanhyia	46.4	51.1	16.1	10.5
National	**113.8**	**105.0**	**82.2**	**36.8**

Source: Field Survey, March 2014 and NDPC (2014).

The age participation of the school children was further assessed and it was revealed that children along the intervention corridor start school at an earlier stage than those along the control corridors (see Table 4.16 for details). For example, the average age for participation at primary for boys was 6.8 years on the intervention as compared to 8.1 years along the control corridors. Whereas the difference between the boys was more than a year, that between the girls was eight months. The lower difference for the girls may be attributed partly to the girl child educational policy which was operational in almost all the study corridors. The details on the other levels are shown in Table 4.16. Surprisingly, girls starting age along the intervention corridors was on average higher than that of the boys. But for the corridor specific analysis, girls start age at the various levels was lower than the boys except at the JHS level where the girls starting age was higher than the boys. Evidence from the field presents an interesting dimension on the control corridor as some corridors had no age record for boys at the SHS level. On the Atuna-Nsuhunu corridor no age was recorded for girls at primary and JHS levels. This may be related to the distance needed to get to school from the community. The boys also do not participate beyond JHS which implies they also take to farming which can perpetuate their poverty levels and retard the achievement of the MDG on education. The age participation presents mixed results, as some are at variance with the earlier assertion made by some households, teachers and the focus group discussions that girls on the control corridor attend school at an older age. The results with the exception of KG, all the other levels had girls being younger than the boys.

Table 4.16. Age participation along the corridors

Corridor	**Kindergarten**		**Primary**		**JHS**		**SHS**	
	M	**F**	**M**	**F**	**M**	**F**	**M**	**F**

Intervention	3.9	4.2	6.8	7.1	13.8	14.3	16.8	17.0
Control	5.3	5.6	8.1	7.9	15.3	15.1	17.4	17.1
Intervention Corridors								
Agona-Wiamoase	3.9	4.1	6.2	6.5	13.6	14.2	15.9	16.3
Poano-Ntinanko-Adoowa	4.1	3.8	7.1	6.8	14.1	14.4	16.6	16.1
Awisa-Atuna	4.7	4.8	7.4	7.9	13.6	14.2	17.6	18.1
Old Drobo-Ponko No.1	3.8	4.2	6.6	7.2	13.8	14.6	16.9	17.4
Control Corridors								
Kokoteasusa-Wiamoase	4.8	5.2	8.2	7.9	14.7	15.2	-	16.8
Kokosua No. 1&2	4.2	4.6	7.6	7.1	15.3	15.1	16.7	16.3
Atuna-Nsuhunu	5.3	5.8	8.4	-	15.8	-	-	-
Aniantetem-OdumaseAmanhyia	5.6	5.2	7.7	8.1	14.5	15.0	17.4	17.8

Source: Field Survey, March 2014

The mean number of trips made to school by the children is next reviewed.

iii) **Average Number of trips per week**

Based on the field surveys, it was revealed that children along the intervention corridor attended school more regularly as indicated by the number of times they attend school in a week. On average children on the intervention corridor attend school 5 days a week but those on the control corridor did so on only 3 days. The high school attendance on the intervention corridor could be related to the presence of schools in the communities concerned and hence, the ease with which they could reach the schools. For instance, all the intervention corridors had primary schools in their respective communities with the exception of Atwetweso and Atuna. This goes to confirm that, all things being equal, where there are schools within the communities it influences school attendance to a greater extent. This was clearly seen in Atuna where the non- existence of schools reduced attendance to 3 days on average per week, although it is an intervention community. Consequently, Kokosua 1 and 2 control communities rather recorded 4 days of attendance which could be attributed partly to the location of primary schools within the communities. Nsuhunu recorded 2 days a week which was also the least on the control corridor and the only corridor among the control without any school facility. In Kokosua 1, the chief farmer‘s wife threw more light on school attendance, *"For the communities around here the factors that are critical for attendance are the presence of schools within the community and the distance to be travelled, so longer distances and absence of schools deter attendance"*

Table 4.17. Number of children in a household in school and number of trips per month to school

Corridor	No. of Trips per (month)	Kg		Pm		JHS		SHS	
		No.	%	No.	%	No.	%	No.	%
Intervention	100	102	18.6	281	51.2	109	19.9	56	10.2
Control	60	35	25.2	62	44.6	27	19.4	15	10.8
Intervention Corridors									
Agona-Wiamoase	80	25	14.5	84	48.8	40	23.3	23	13.4
Poano-NtinankoAdoowa	80	37	23.7	75	48	30	19.2	14	9
Awisa-Atuna	60	21	21.1	56	56.6	16	16.2	6	6
Old Drobo-Ponko No.1	100	19	15.7	66	54.6	23	19	13	10.8
Control Corridors									
KokoteasusaWiamoase	60	6	16.7	18	50	9	25	3	8.3
Kokosua No. 1&2	80	10	19.6	19	37.3	12	23.5	10	19.6
Atuna-Suhum	40	6	75	1	12.5	1	12.5	0	0
Aniantetem-OdumaseAmanhyia	60	13	28.9	24	53.4	5	13.3	2	4.4

Source: Field Survey, March 2014.

The improvement of the roads on the intervention corridor could also be partly responsible for the high attendance on the intervention corridor which translates to 100 trips per month as compared to 60 trips on the control corridor as indicated in Table 4.17. Coupled with this, about 71.8% of the children on the intervention corridor executed their trips on daily basis, with 90.1% on the control corridor. Although schools were distant for children along the control corridor, not only did they attend daily but also did so very frequently.

The incentive for the high attendance could be the better tuition received on the intervention corridor. Another likely reason, responsible for the high attendance on the intervention corridor was the quality of teachers and teaching aids. For example, at a school in Bipoa on the Agona-Wiamoase corridor more than 80% of school children walk daily over distances of between 1-1.5km from Kofikrom and Oppongyaw to the Bipoa L.A school due to the quality of teaching given and other programmes with additional tuition by the school at no cost to the students. This situation was surprising because there was a primary school in Kofikrom which operates the school feeding programe. The road has made it possible for the school to access quality teachers who may have contributed to the improved school enrolment. Another study which confirm the view that improvement of roads impacts positively on school enrolment is AU/UNECA (2005:19) which study reports the indirect effect of allowing opened up locations to have access to quality resources such as teachers and teaching aids. The implication is that those corridors with schools within the respective communities and good resources will gain more in terms of the knowledge acquisition than those without schools, making those with schools better off in educational attainment leading to the achievement of the MDG 2.

Additionally, the road improvements also facilitate the recruitment of quality teachers, as was the case in Wiamoase and Ntinanko; to mention a few. The opposite was the situation along the control corridors, though some communities had schools within the community but the nature of the road deters flow of resources such as teachers. A good example was Kokotesua, where the non-existence of complementary facilities like electricity deter teachers from accepting postings to such locations and those who do also do not stay for long periods. The area council chairman of Kokotesua a control community had this to say:

‗Trained teachers are posted to the community yearly but some stay for a term or two and leave although the community provides them free accommodation and foodstuffs. We believe they need electricity to operate their phones and computers so they leave to the towns".

This phenomenon therefore has the potential to retard the attainment of target (3) goal 2 of the MDGs on ensuring that children everywhere (boys and girls) are able to complete a full course of primary schooling by the end of 2015.

Table 4.18: Sex of children in a household in school from KG to SHS on the corridors

Corridor	Kindergarten				Primary				Junior High School				Senior High School				TOTAL	
	M		F		M		F		M		F		M		F			
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Intervention	55	10.0	47	8.6	152	27.7	129	23.5	59	10.8	50	9.1	30	5.5	26	4.7	548	100
Control	26	18.7	9	6.5	46	33.1	16	11.5	20	14.4	7	5.0	11	7.9	4	2.9	139	100
Intervention Corridors																		
Agona-Wiamoase	11	6.4	14	8.1	35	20.3	49	28.5	16	9.3	24	14.0	13	7.6	10	5.8	172	100
Poano-Ntinanko-Adoowa	15	9.6	22	14.1	40	25.6	35	22.4	18	11.5	12	7.7	9	5.8	5	3.2	156	100
Awisa-Atuna	7	7.0	14	14.1	41	41.4	15	15.2	6	6.1	10	10.1	4	4.0	2	2.0	99	100
Old Drobo-Ponko No.1	10	8.3	9	7.4	40	33.1	26	21.5	17	14.0	6	5.0	11	9.1	2	1.7	121	100
Control Corridors																		
Kokoteasusa-Wiamoase	5	13.9	1	2.8	13	36.1	5	13.9	8	22.2	1	2.8	3	8.3	0	0.0	36	100
Kokosua No. 1&2	3	5.9	7	13.7	13	25.5	6	11.8	8	15.7	4	7.8	6	11.8	4	7.8	51	100
Atuna-Nsuhunu	5	62.5	1	12.5	1	12.5	0	0.0	1	12.5	0	0.0	0	0.0	0	0.0	8	100

Aniantetem-OdumaseAmanhyia	10	22.2	3	6.7	12	26.7	12	26.7	4	8.9	2	4.4	2	4.4	0	0.0	45	100

Source: Field Survey, March 2014

iv) Gender and Basic School Participation/ Achievenent

After assessing the number of trips made to school, a further analysis was done to determine the number of girls as opposed to boys in school at the various level of education. The results as presented in Table 4.18 gave differing views, though boys dominated on both corridors when the number of school going children were analysed, the situation diferred when the data set was further disaggregated. A further break down into the different corridors presented interesting results. Agona-Wiamoase corridor, an intervention corridor, had girls outnumbering boys from KG to JHS in terms of enrollment. For instance, 20.3% of boys and 28.5% of girls were enrolled at the primary level. The trend changed to the norm at the SHS level where boys dominated. A female parent at Wiamoase explained the scenario further,

"My girls are able to attend school early with the road improvement, it has also enabled the water company to bring in more boreholes which has reduced the time for queuing to fetch the water. Again the environment is safe for them to walk unaccompanied to school which have helped them and now they have so much interest in school"

Poano-Ntinanko-Adoowa corridor also had females outnumbering males only at the KG level. This finding is in support of Levy's (2004) study of Morocco where improvement in a road coupled with the location of school doubled the number of girls who attended school. The field data further revealed that the Awisa–Atuna corridor also have females being more than males at the KG and JHS level where the females formed 70% of the class in the latter school (see Table 4.18). All the corridors have received treatment which could be a reason for the increase in female participation in education, though at different levels of education. It is also possible that the location of schools could have played a role in this respect as well as parents feeling secured because of the environment and safer roads to allow girls to attend school. Again, the girl child programme in the respective districts could also be an important factor for the girls' high enrolment. Efficient transport facilitates movement of goods, people and service, the transport used by school children to execute their education is important.

v) **Mode of transport used for the school trips**

Modes used for the school trip were basically walking and motorized means. The predominant mode however was walking on both corridors, as shown in Table 4.19, where

94% and 95.9% of school children used this mode on the intervention and control corridors respectively for the school journeys. Primary school children had a higher proportion of children walking on both corridors, as 88% and 99% used this mode on the intervention and control corridors respectively as shown in Table 4.19, since this is the only mode at their disposal. This finding supports Porter‘s (2002) view that rural people inhabit a walking world.

A similar model operational on the Awisa-Atuna corridor presented an interesting dimension to the _rural walking bus‘ where girls lead the walk and the boys walk at the rear, serving as security on the school travel (see Appendices 4.4 and 4.5).

It can be inferred from the forgoing that, the children on the corridors without schools take charge of their travel needs to access education. Not only do the school children walk over long distances as indicated in Table 4.19, about 71.8% and 90.1% do this daily on the intervention and control corridors respectively.

The distant location of schools which compel the school children on the control corridor to walk further did not affect the frequency at which they used educational facilities. The children on the control corridor, not only attend school daily but as high as 84.6% also do so very frequently as compared to only 58.8% on the intervention corridor. Children in Kokosua 1 & 2 recorded the highest in terms of frequency to school as 90.6% of the school children walked for an average of 30 minutes (one way) daily to school. All the foregoing confirms that children of school going age and in school on the control corridor showed a higher commitment towards schooling than their counterparts on the improved road, although the burden placed on them was higher. It is possible that the limited number of schools in some control communities may be the reason for their enthusiasm towards education and the premium placed on them. A head teacher at Amanhyia commented on mode used for the school travel,

“ Most parents at Amanhyia did not have the opportunity to education so are excited to send their wards to school so they get better jobs in the future, so some encourage the children to be determined and serious even if they have to walk the whole day to school”,

With regard to motorized transport, children on the intervention had better access to motorized transport but this was limited on the control corridor as 22% of JHS pupils used this mode for the journey to school, but only 16% (see Table 4.19) did so on the control corridor. Those in primary school had the highest burden on the control corridor as only 1% used motorized means for the school travel. Afua a farmer and trader is determined to educate her girl child in spite of the difficulty she faces with no school at Oppongyaw,

" There is no school in my community so l bring my children to Wiamoase once a week to attend school, this in my view is better than allowing them in the house the whole week"

Interestingly, those using the motorized transport for the school travel were mostly those who travel with their mothers to sell at the weekly markets, representing the 4% on the control who attend school on weekly basis as shown on Table 4.17. This situation has implications for the anticipated completion of primary school by the end of 2015, thus retarding the achievement of the MDG 2. Motorised transport was seen to be patronized by school children travelling longer distances (23.7km on the control corridor compared to 7.7km on the intervention corridor) to access educational facilities. Papa Koo a cashew farmer at Kokosua 11 explained the mode used by his children to school,

"When my children are young they walk to school as it is not far away, but when they get to secondary school they go by car as it is in Sunyani, but my niece at Sampa though attend secondary walk because the school is within the community."

For example, those in SHS were found to use motorized transport wholly on the control corridors as indicated in Table 4.19, but two thirds use this mode on the intervention corridor. The location of SHS schools along the Agona-Wiamoase corridor could be a reason for the one third who walk to school along the intervention corridor. As distances to a facility increases motorized means of transport is the preferred mode and vice versa.

Table 4.19 Average travel time and mode of transport used to access educational facilities

Corridor	Kindergarten			Primary			Junior High School			Senior High School		
	Travel Time (mins)	Modes (%)		Travel Time (mins)	Modes (%)		Travel Time (mins)	Modes (%)		Travel Time (mins)	Modes (%)	
		M	Walking		M	Walking		M	Walking		M	Walking
Intervention	64.04	12.6	87.4	71.69	12	88	108.93	21.6	78.4	76.18	75.9	24.1
Control	113.06	3.4	96.6	131.44	1.5	98.5	200.44	16	84	121.37	100	-
Intervention Corridors												
Agona-Wiamoase	56.05	4.2	95.8	73.16	7.3	92.7	85.93	7.7	92.3	96.0	47.8	52.2
Poano-Ntinanko-Adoowa	21.17	20.6	79.4	56.81	18.3	81.7	66.80	28.6		108.32	92.9	7.1
Awisa-Atuna	74.62	20	80	116.33	17.9	82.1	113.67	33.3	66.7	207.8	100	-
Old Drobo-Ponko No.1	16.72	10.5	89.5	34.90	11.3	88.7	63.07	30	70	121.44	100	-
Control Corridors												
Kokoteasusa-Wiamoase	38.33	100	-	55.91	100	-	31.11	100	-	195.80	100	-
Kokosua No. 1&2	41.08	10	90	63.70	100	-	83.06	9.1	90.9	281.75	100	-
Atuna-Nsuhunu	90.87	100	-	319.22	100	-	264.61	100	-	-	-	-
Aniantetem-Odumase-Amanhyia	127.60	100	-	185.61	4.2	95.8	483.53	75	25	224.50	100	-

Source: Field Survey, March 2014

iv) Travel time to educational facilities

According to Robert et al. (2006) travel time is a better measure of accessibility to facilities than distance. Travel time to school is important and related to the place of residence of the school children. From the survey, the time taken to school was higher on the control corridor than the intervention corridor. For example, primary school children used 72 minutes to walk a distance of 4.11km in comparison with their counterparts living along the control who use twice that time to walk to school (see Table 4.19). Those on the former corridor‘s travel time is within the accepted range of 4km/hr walking duration but those on the latter corridor have a greater travel burden.

School children from Atuna had the highest travel time to all educational facilities; 116 minutes was used by primary pupils to also cover an average distance of 6.7km and those in JHS cover the same distance within a shorter time of 113 minutes. The JHS pupils could probably cover the same distances within a short period due to the fact that they are older and could walk faster than those in lower classes. It is also possible that because the distances were far off, they had to double up their steps, for example JHS students from Aniatetem had to walk 7km (one way) to school at Safokrom where the nearest and only school was located. According to the headteacher of the Safokrom school, the distance taken to school has a potential to deter attendance and also partly responsible for the high dropout rate on the corridor. A male teacher at the LA School at Safokrom explained in the situation in the following statement:

> *"It takes about an hour and half on average to walk from Aniatetem to Safokrom (one way). But this is the only JHS school in the area so children have to do three hours a day on average to attend school. The environment is also not safe, as dangers such as rape, attack from wild animals and child trafficking are all possible. These dangers and the distances involved all influence attendance and drop out rates for students."*

By implication these children use three hours to undertake this activity daily, which has the potential to discourage some from going to school regularly and eventually reduce enrolment and increase drop-out rate but there were no district figures to support the assertion. SHS students took the highest time of 207minutes to cover an average distance of 15km. With the exception of Wiamoase which had a secondary school all the communities did not have any such school and so students had to travel long distances to access them. It is also possible that because SHS is a higher level service, its catchment area is much more wider than those of the lower order schools confirming one of the major findings of a comprehensive study of ―Human Settlements and Services Delivery in Ghana‖ (for details, see, Adarkwa(ed) (2014).

A further analysis on the travel time, revealed higher percentage of pupils walking shorter times of 0-30minutes to school on the intervention corridor to be 36.1% compared to 21.8% on the control corridor as shown Table 4.20 Those travelling between 31- 60 minutes were rather higher on the control corridor. The reduction in travel time on the intervention corridors could be as a result of the increased number of schools located along the corridor, which has reduced the distances to be covered.

Table 4.20 Travel time intervals to school e.g. 0-30, 31-60 and 60+

Corridor	0-30 minutes	31-60 minutes	60 minutes+	Total
Intervention	202	229	128	559
Control	27	61	36	124
Intervention Corridor				
Agona-Wiamoase	48	93	42	183
Poano-Ntinanko-Adoowa	71	74	23	168
Awisa-Atuna	47	56	4	107
Old Drobo-Ponko No.1	44	52	18	114
Control Corridor				
Kokoteasusa-Wiamoase	8	17	12	37
Kokosua No. 1&2	11	14	12	37
Atuna-Nsuhunu	-	3	9	12
Aniantetem-Odumase-Amanhyia	12	9	17	38

Source: Field Survey, March 2014

To summarise, improvement in rural roads can be used as an explanation for the increase in enrollment for boys and girls on the intervention corridor, but the increase was significant for girls on the intervention corridors than the control corridors. The safe environment provided by the roads enabled more girls have access to basic education particularly on the Agona–Wiamoase corridor. Frequency of school attendance was also found to be higher along intervention rather than control corridors for diverse reasons. Quality of teaching resources, both human and material, was better on the intervention corridor compelling some children to walk longer distances to enjoy the services. Transport mode usage was directly related to distances involved in the journey to school, as primary schools with lower coverage saw more than 80% on the intervention corridors walking to access schools.

Although children on the control corridors covered longer distances, as indicated in Table 4.19, they still walked because children travel needs were not included in the planning of households travel activities. On the other hand, as distances increase beyond certain thresholds, motorized mode of transport is used. All the issues discussed under education will help to boost primary education, among others, to address the MDG on education and resolve the poverty problem in the long run. Another service essential for the well being of households is their healthcare.

4.5.2 Access to Health Facilities on the Study Corridors

Having access to health is important as it keeps the household well to be able to work in diverse capacities to earn income to improve themselves. The different facilities available to the households were assessed as health needs are critical.

i) Type of Health Facilities available to the study communities

From the field survey, the health facilities available to the households include: hospital, health centre, health post, clinics, maternity homes and chemical shops. These facilities were not necessarily located in most of the communities along the study corridors, but located centrally to serve a catchment area. For the purpose of the study, the facilities most frequently used by the households were analyzed including: hospitals, health centres and clinics. Hospitals were distant from the communities and served as referral points from the lower health facilities. In all, four hospitals were utilized by the corridors studied which were the Bekwai Government Hospital, Wenchi Methodist Hospital, Sampa Government Hospital and Agona Government Hospital. Households on the intervention corridor cover shorter distances to hospitals but the opposite was the situation on the control corridors as shown on Table 4.21.

There were ten health centres serving the households on the study corridors. Coincidentally, Wiamoase was the only community in the study area with multiple health facilities and these are the Salvation Army and SDA Health centres (see Appendix 4.2) which represent a third of the health centres in the district placing households at an advantage in the district (*GHS Annual, Sekyere South District, 2009 cited in Sekyere South District Assembly, 2013*) to address their health needs particularly for children and pregnant women. The Salvation Army facility was under expansion at the time of the survey, primarily because of the increase in cases and partly as a result of the road improvements which has widened its catchment area. A similar study in Kenya by Airey

(1992) also showed that a hospital's area of influence increased with construction of a road in Kenya.

Several clinics were also available to the rural inhabitants. Households in the Jaman north district had the highest number of clinics (14) with Sekyere South District having the least of one (see Appendix 4.2). The limited number of clinics in Sekyere South District is possibly compensated for by the number of health centres as it had the highest among the study districts. A few of the intervention communities namely: Ntinanko, Wiamoase, Old Drobo and Awisa had chemical shops located within the communities to provide first aid needs of households. Access to healthcare facility is essential but the magnitude of the services received depends on the ability of the user having frequent access and their willingness to pay.

ii) *Frequency of trips made to the various health facilities*

The survey revealed that, clinics were the most visited health facility, with an average of 8 and 10 visits per household on the control and intervention corridors respectively per year. This may be due basically to its proximity to most of the settlements, in terms of the distance and travel time, as will be elaborated on later in this study. Aunty Abena a resident at Adoowa on the P-N-A Corridor explained her choice of healthcare,

"I and my children visit the Poano clinic when we are sick because it is closer than the Bekwai Hospital, but if the illness demands us going there we do so".

Health centres were the second most visited facility after clinics in the study area. Households made 4 visits on the control corridor compared to 6 trips on the intervention corridors per annum. Wiamoase, by virtue of the fact that it has two of the facilities, made the highest corridor frequency of 6 times on average within a year. The Administrator of one of the health facility at Wiamoase explained health intervention in place for control communities, *"The health centre has an ambulance to bring in emergencies from the surrounding communities, as the centre has provided them with emergency numbers to call, especially women in labour".*

Neighbouring communities also depended on this facility, particularly the Salvation Army Health Centre since it had an ambulance to attend to emergencies, especially those outside the community. Kwabena a native of Wiamoase was thankful there were two health facilities in the community,

"We are happy to have two health facilities, it makes life comfortable and easy to access as the Salvation Army Health Centre is within walking distance. I think this has improved our health status greatly."

On average households make 3, 4 and 6 trips to a hospital in a year for the baseline, control and intervention periods respectively. The operations of the National Health Insurance Scheme (NHIS) which made healthcare affordable during the survey period, could be a possibility for households increased visits to the hospitals. Alternatively, the increase in visits at the intervention period could be partly due to the road improvement which facilitates movements. Adwoa explained the increase in visits to health centres at Ntinanko,

"Before the improvement of the roads it took a longer time to get to the hospital from here but with the improvement it has reduced the time by more than half. Now it does not matter the distance the availability of vehicles enhances the trip."

Similar results were revealed in other studies in Zambia, Ethiopia and Vietnam where improvements on rural roads led to enhanced mobility to far off locations for residents in Vietnam and Zambia but those in Ethiopia rather had improved accessibility as the road improvement brought in a market where most of their activities are executed (Bryceson, Bradbury and Bradbury, 2006).

Whereas the current study revealed improved mobility to hospitals along all the studied corridors, households on the Agona-Wiamoase corridor had enhanced accessibility to health centres as mentioned earlier in the study. This implies that rural roads improvement can have either a mobility or accessibility impact on users of services.

Table 4.21 Travel Time, Travel Distance, Travel Speed and Cost of Travel to Health Facilities

	Hospital				Health Center				Clinic			
	Average Travel Time	**Average Distance (km)**	**Speed (km/hr)**	**Average travel Cost GHS**	**Average Travel Time**	**Average Distance (km)**	**Speed (km/hr)**	**Average travel Cost GHS**	**Ave. Travel Time**	**Average Distance (km)**	**Speed (km/hr)**	**Ave. Travel Cost GHS**
Intervention	30.67	13.80	27.07	3.35	15.57	7.92	30.52	1.84	15.94	7.69	28.95	1.47
Control	75.30	13.12	10.45	3.08	49.67	11.13	13.44	2.15	19.29	5.14	15.98	2.26
Intervention Corridors												
Agona-Wiamoase	16.54	5.32	19.30	1.50	12.60	5.06	24.10	1	16.14	5.20	19.33	0.80
Poano-NtinankoAdoowa	47.90	27.12	33.97	6.58	30	14.48	28.96	5	15.72	8.59	32.79	1.56
Awisa-Atuna	28.78	13.42	27.96	1.29	40	21.38	32.07	1.20	16.25	7.22	26.62	1.20
Old Drobo-Ponko No.1	32.77	13.82	25.30	2.40	10.14	4.90	29.00	1	15.95	7.70	28.97	1.30
Control Corridors												
Kokoteasusa-Wiamoase	63.44	13.26	12.54	2.02	39	6.53	10.05	1.88	37.50	7.25	11.6	1.90
Kokosua No. 1&2	51.54	19.66	22.88	2.36	-			-	15.42	7.59	29.53	2.50
Atuna-Suhum	92	35.28	23.01	4.0	-	-	-		-	-	-	
Aniantetem-OdumaseAmanhyia	90.36	43.72	29.16	3.38	71	36.27	30.66	2.70	47.50	22.93	28.96	2.37

Source: Field Survey, March 2014

iii) *Average Distance to Health Facility*

Generally, the average distance travelled to access health facilities ranged from 5.14km to 13.8km on both corridors. The baseline situation was much higher 24km according to the cocoa clerk at Adoowa. This was confirmed at the various focus groups discussions, as one old man at Adoowa on the P-N-A Corridor during the survey commented on the distance to health facilities before the road improvements.

"About ten years ago you had to travel some 22km by trotro on the poor potholed dusty roads, which nearly made us lose our grandson who had malaria. In another related incident Agya"s wife lost their first born because there was no skilled attendant in the community and the delay they faced before getting to the health facility in the other community".

On average, the distances covered by households to access clinic were lower on the intervention corridor (4.3km) corridor than the control corridors (5km). Though the distances are lower than the 8km standard to reach a health facility, it was still far as the readily available mode on the control corridor is walking (the recommended is 4km/hr) according to Nkum and Associates (2003) when motorized means are not available under critical conditions.

The distance to the clinic on the control corridor, though below the 8km limit, could still be problematic in critical situations due to the nature of the road, coupled with the nonavailability and irregularity of vehicles. This has the ability to affect the frequency of use of the health facility, and could lead to the dependence on self medication and the use of herbal medicine especially among households on the control corridor, due to the peculiar difficulty in accessing vehicles and the poor nature of their roads. Amina at Odumase confirmed this assertion in a control community:

―We always buy a few drugs from the chemical shops on market days and keep for emergencies like stomach aches, headaches and bodily pains for our households. This is done to save ourselves as the distance to the health facilities are far from here. We know that, it is dangerous to have the different medicines but it is the best of two odd situations

because the nurses come once in two months. For some illness too the plants our ancestors showed us are more effective than the hospital ones, so we depend on them".

The known assumption that people being rational will use the closest facility, may not always be the case as some women mentioned at the focus group discussions. This is because some clinics, especially the private ones, do not accept the NHIS card. This situation compel some households to travel longer distances to the hospital to access health care (Bailey and Phillips, 1990), cited in Grieco et al. (2009), support this view with their Jamaica study where low-income people had to use a distant health facility because of the economic implications associated with accessing the nearest facility. Distances to hospital on both corridors were generally higher than the other health facilities. This may be attributed to the fact that the geographical sphere of influence of a hospital is wider and provide higher order services. This notwithstanding, households who visit the hospital for first aid care are thus kept for hours and at times frustrated which has the ability to deter them from its usage in future.

Generally, distances were longer and time spent in travelling was higher on the control corridor than the intervention corridor. For example, households on the intervention corridor use on average 30.6 minutes to cover a distance of 10.4km, but those on the control corridor require double that time to cover the same distance. Vehicle speed is a function of the road condition, whereas the potholed roads, as exhibited in Appendix 4.7 compels some women to mend the road, on the control corridors increase speed levels, (for example hospital speed was 10km/hr on the control corridor compared to 27km/hr on the intervention corridor) smooth corridors rather increase speed levels thus reducing the travel time. The dominant use of motorized transport added to the smooth road surface reduces the travel time on the intervention corridor making households better to achieve the health MDG.

Households along the Poano–Ntinanko–Adoowa corridor had the highest speed to access a clinic of 33km/hr as compared to 12km/hr along the Kokotesua corridor (see, Table 4.21). This means that under serious condition of a pregnant woman in labour, it could be a life and death situation in the latter community due to the reduced speed and the poor condition of the road. Porter (2002) supports this view with her study in southern part of Ghana.

The limited or absence of health facilities in rural areas compels them to travel over long distances to access health care, which consequently affect household usage of the facilities. The high speeds recorded along the intervention corridor could be explained by the road improvements Beyond the improved road is the ability of the users to use the transport services to improve their mobility. The cost component is therefore assessed to better place households‘ economic burden in accessing health facilities on the study corridors.

v) Average Transport Cost to Health Facilities

The cost of transport is related to the type and location of the facility. From the survey, the average transport cost ranged from GHS 1.47 to GHS 3.35. Generally, the cost of transport was lower on the intervention corridor than the control corridor. However, the cost to the hospital was higher on the intervention corridor at GHS ₵3.35 compared to GHS 3.08 on the control corridor, although the average distance covered on the control corridor, was higher; 16.7km compared to 10.4km on the intervention corridor. Not only was the total cost of transport high on the intervention corridor, the average cost per kilometer was also higher on the intervention corridor than the control corridor. For example, a kilometer of travel to a hospital cost .30p on the intervention corridor but cost only.18p on the control corridor. The cost to a clinic; cost .45p per km on the control corridor but cost .23p more on the intervention corridor. This could be explained by the long distance travel usually undertaken by the control communities which reduces the cost, but the intervention corridors dependence on taxis over short periods makes the transport tariffs higher. The control corridor households depend mostly on size and medium sized trucks or on old taxis. This view was confirmed by the transport operators along the control corridors. A driver, Baba Yara operating on the Agona- Wiamoase Corridor confirmed what the households mentioned,

"The fare charged for taxis is higher than trotro, but most of us operate the taxis because that move fast because it require only four people, so that explains why the cost of transport seem higher for the intervention corridor than the control corridor households."

Poano–Ntinanko–Adoowa corridor recorded the highest cost of transport to all health facilities as indicated in Table 4.21, for instance GHS 6.58, GHS 5 and, GHS1.56 were the amounts spent on the average to access a hospital, health centre and clinic respectively.

This was due primarily to the use of taxis as the main mode of travel on the corridor which charges higher than the small and medium sized trucks and the pick up truck usually at the disposal of households along the control corridor. It is also possible that the numbers carried per trip are less thus the high fares to offset the vehicle operating cost. The scenario on the control corridor was not surprising, as evidence from the field indicated in Table 4.21, revealed Nsuhunu to be the community with the highest transport cost to access health facilities. The poor nature of the road which has resulted in scarcity of vehicles led to an increase in transport cost to health facilities. The non–existence of a health facility in close proximity could be a probable cause for their plight. This may deter households from accessing orthodox healthcare which could worsen the health conditions of the parties involved in the long run.

For easy access, the presence as well as the proximity of households to the facility has the potential to reduce the transport cost and facilitate better patronage. The fuel price increases could also be a reason for the high transport fares and not necessarily the distance nor the road condition.

Generally, the cost of transport was higher on the control than the intervention corridors, but in terms of cost per km for passengers was higher on the intervention. By implication, shorter distances were more expensive than longer ones. Again the high fares on the intervention corridors could be related to their dependence on taxis, especially for the short distances, while control communities relied mostly on small and medium sized vehicles which had lower fares per km. Again, transport costs to hospitals from the survey were higher than the other health facilities. This indicates that there was a correlation between distance and location of facility. Mode used by households is important as a few seconds delay in accessing health care may be a matter of life and death.

vi) Mode of Transport used to access Health Facilities

Road transport facilitates access to health care delivery particularly in remote areas and links rural households to the various health facilities. It helps people to utilize health facility, increase the services range and presents alternatives to users (AU/UNECA, 2005). Households in the survey used motorized and non–motorized means to connect to the facilities. The motorized means of transport included taxis, small and medium sized vehicles, On the other hand, the only non–motorized means of transport covered in the study were bicycles. From the survey it was found out that motorized means of transport was the main means of transport used by most households to access health care on all road corridors. For example, 64.3% of households on the intervention corridor used motorized means of transport to access health care while 74.5% of households do so on the control corridors. The distances involved could be a factor for the mode choice. Although motorized means of transport was mainly used, this becomes a challenge on the control corridors where vehicles operate mostly on market days. Where there were facilities within the community like, Wiamoase and Kokosua (a control corridor), but had a rural clinic, 61.2% and 66.7% walked to access the health care on the Agona- Wiamoase and Kokosua 1 and 2 corridors respectively. A woman, Dogol in Wiamoase explained the benefits of health facility to her;:

—I am happy there is a community facility to fall on in case of emergencies, as the nurses give some basic medication before a referral with the condition of the sickness is beyond them, otherwise you can have full treatment and discharged. This way you do not have to bear any transport burden except walking to the facility. It is better for the poor than travelling long distances to the facility, particularly for health".

This implies that where facilities are located in close proximity, walking becomes the preferred means of transport. Brysecon et al. (2006) in their study of Asia and Africa found that the improvement of a road brought in a market in Ethiopia which reduced rural people's travel as they just walked to the market, thus their accessibility was enhanced. Improving roads to enhance accessibility, all things being equal, is preferred to enhancing mobility, as the former reduces the need to travel and lessens the transport burden on households. This will improve the welfare and the MDG on health which will make the household strong to work to earn incomes to improve themselves and their households. The health status of women and children were also assessed as this has implication on their welfare.

vii) Maternal and Infant mortality on the study corridors

Access to health care was relatively better on the intervention corridor than the control as shown in the earlier discussions. In the area of maternal health there were services across the respective districts to serve the population but, the only down side was the distances involved in getting to the facilities. Those living along the intervention corridor however, had better access to health facilities as the availability and reliability of vehicles during the day facilitates their movement, thus reducing one of the risk factors of pregnant women. For instance, travel time before the road improvement had reduced from 60 minutes on the Poano–Ntinanko–Adoowa corridor to 28 minutes after the intervention period, to the Bekwai Government Hospital. Those on the control corridor face the highest risk, due to the non-availability of vehicles coupled with the poor nature of the roads which lead to delays and are critical in determining whether the patient lives or dies.

Based on the survey, Jaman North District had no records of maternal deaths for the year 2006 according to the District Medium Term Plan (2009-2013). This was confirmed at the Sampa Government Hospital, Seketia clinic and from the women‘s focus group discussions held in Old–Drobo, Ponko 1 and Nsosomea. Bekwai and Sekyere South districts maternal mortality rate are alarming at 200/100,000 births (Bekwai Municipal Assembly, 2013; Sekyere South District Assembly, 2013) which is above the national figure of 155/100,000 as indicated in Table 4.22. Though the district seems not to be doing well, households on the intervention were better served with maternal care than those on the control corridor. It is important that the right measures are put in place to address the issue.

Table 4.22 Health (Infant and Maternal Mortality)

<table>
<tr><th>District</th><th>Road Corridor</th><th>Infant Mortality</th><th>Maternal Mortality</th></tr>
<tr><td rowspan="2">Wenchi</td><td>Awisa-Atuna</td><td rowspan="2">19/1,000</td><td rowspan="2">4/100,000</td></tr>
<tr><td>Atuna-Suhum</td></tr>
<tr><td rowspan="2">Bekwai</td><td>Poano-Ntinako-Adoowa</td><td rowspan="2">4/1,000</td><td rowspan="2">200/100,000</td></tr>
<tr><td>Aniantentem-Amanhyia-Odumase</td></tr>
<tr><td rowspan="2">Jaman North</td><td>Old-Drobo-Ponko No. 1</td><td rowspan="2">6/1000</td><td rowspan="2">0/100,000</td></tr>
<tr><td>Kokosua No. 1& 2</td></tr>
<tr><td rowspan="2">Sekyere South</td><td>Agona-Wiamoase</td><td rowspan="2">75/1000</td><td rowspan="2">200/100,000</td></tr>
<tr><td>Kokoteasua-Wiamoase</td></tr>
<tr><td>National</td><td>-</td><td>53/1,000</td><td>155/100,000</td></tr>
</table>

Source: Ghana Health Services, 2013

A similar study which supports this view is AU/UNECA (2005), where the authors assert that any delay in reaching a health facility could affect the immediate and phased treatments. Such delays also affect children who are more vulnerable and could lose their lives as observed by Porter (2002) in her Ghana study. This notwithstanding, some districts have put in diverse measures to rescue such incidents. For example, the Salvation Army Health Centre has an ambulance and provided all rural settlements with an emergency number which enables them to call for their services. There were other measures aside the ambulance service as mentioned by one administrator at the Salvation Army Health Centre,

"The facility also runs an outreach programme to assist pregnant women and children in its catchment area. The community nurses visit the area councils once a month to educate the women on their reproductive, child care and general well being. These measures are to help reduce child and maternal mortality in the district".

Jaman North District Health Services have also put in maternal education which enable them access health care regularly and has improved the health of mothers, as this was evident in the district in 2006 where no maternal deaths were recorded (see Table 4.22). It is possible that the road improvements also facilitated the programme to reduce maternal mortality since most of the roads in the district had been improve and works are on-going to improve the remaining ones. Government policy on free maternal care could also be a reason for the occurrence and the use of the NHIS to access maternal healthcare.

Evidence from the field data indicates that childcare has improved as most communities had health professionals coming in on regular basis to weigh, immunize and provide other health needs. About 90% and 73% of households on the intervention and control corridors respectively revealed that this has been the practice in recent times; probably in line with government policy. The infant mortality rate of the districts attest to this as; for instance, all the rates recorded in the districts were lower than the national figure of 53/1000 (see Table 4.22). This is encouraging because the three districts stated that the infant mortality figure includes the under five mortality. However, the corresponding figure for Bekwai Municipal was only 12/ 2000. This notwithstanding, the Sekyere South district trailed behind the other districts and measures deem appropriate should be applied to facilitate the achievement of the MDGs.

On average households on the intervention corridors had better access to maternal and infant care than those on the control corridors. For example, households in Wiamoase can visit health facilities more frequently than their counterparts in Kokotesua without any health facility. This finding is supported by Porter (2002) with her study in Ghana which indicates that off–road people usually fail to reach hospital alive especially children due to inaccessibility. The inaccessibility creates a major problem for households on the control as asserted by one lady Maggie at Atuna on the Awisa- Atuna Corridor:

"The nurses come in very often in the dry season, but when the rains start they scarcely visit the community, we think the nature of the road could be a reason. When they visit, they immunize and weigh the children and at times put some medicine in the children"s mouth".

The results reveal that on average immunization programmes are covered completely (once a month) on the intervention corridor but done partially, or not covered, on the control corridors (once in three months) because of inaccessibility issues. A nurse at the SDA Health Centre Wiamoase commented on the role played to help the communities in spite of the challenges we face,

"I know it is important for us to go to the rural areas to help but it is easier where the roads are good, otherwise we go once in three months but when it is in the dry season we manage every other month. It is difficult getting a vehicle back from the remote villages, atimes we walk some 3km before getting a taxi from Kokotesua to Wiamoase"

Though health professionals were scheduled to communities monthly to immunize and weigh the children but this was not executed particularly on the control corridors as this was related to the same inaccessibility challenge. Measures to address the inaccessibility will be a step in the right direction and lead to the realization of the MDG on child and mother welfare.

4.6 Market Facilities used on the corridors

Of all the corridors surveyed, point of sale of farm produce included: home, farm, daily weekly and urban markets. Irrespective of the road type, patronage of the weekly urban markets was the highest followed by the daily markets. The markets serving both corridors include: Bekwai, Wiamoase, Wenchi, Agona, Sampa and Jacobu.

Cash crops

Cocoa and cashew were mostly sold in the respective communities to the agents and the company representatives which include Olam, Akuafo Adamfo, Produce Buying Company (PBC) for cocoa and Greenland Company at Sampa in the Jaman North District for cashew. The study revealed that Greenland is the only large scale company that deals in cashew for export.

Food crops

For the food crops, it was produced basically on subsistence level, where portions are consumed and the rest sent to the daily or weekly markets to be sold to earn some income to purchase more inputs for cultivation as well as other essentials. Wiamoase was the only community along the intervention corridors that had a weekly market, which was patronized with plantain, bananas and cassava being traded in. The field data revealed that 52.6 % and 84.6% of the farmers interviewed on the intervention and control corridors patronized weekly markets.

Proportion of farm produce taken to the weekly markets was usually in larger quantities but food crops which were in small quantities were sold at the daily markets. Of the number interviewed 36.6% of the farmers responded that they sell at the daily market on the intervention corridors as indicated in Table 4.23 but only 13.2% of farmers venture to sell daily in communities along the control corridors. Households on the intervention corridor had the option to sell at the daily or weekly markets, with P-N-A corridor having the highest patronage of daily market (these produce are sold in the community after they have been head-loaded to the home). This finding was quite surprising because the road was in good condition and vehicles were accessible. The high transport tariffs charged was not affordable for the farmers so they had to resort to selling their farm produce at home, as shown by the proportion of farmers selling at home; 86% and 87.5% along the intervention and control corridors respectively. The home option was preferred as indicated by some of the households and confirmed at some of the focus groups because the buyers indicate the day and time before harvesting is done to reduce post harvest losses.

Prices of farm produce along the intervention corridors were higher than on the control corridors. The quantity of goods sold on the farm on the control corridor was higher than those sold along the intervention corridor. On the other hand, proportion of goods sold by the roadside along the intervention corridor rather presented an increase of 598.9% over the control proportions as shown on Table 4.24. The proportions sold at the weekly markets were significant on both corridors but the increase was substantial along the intervention corridors as 88% was sold on the corridor while 80% was sold along the control corridor. The PNA was the least in terms of weekly market patronage, but those on the Old–Drobo-Ponko 1 corridor had the highest patronage of the weekly markets as 84.9% did so, but had the lowest patronage on the daily markets. The low patronage on the PNA corridor was likely to be related to the high transport fares, as confirmed by a taxi driver Jojo Boy at Ntinanko, and not due to non- availability of transport services,

"We make a lot of money on market days but on the other days business boom only in the mornings and evening. Most of the passengers complain of the fares we charge for short distances and prefer to sell their farm produce in the community than paying for freight to the market"

Households on the Awisa-Atuna corridor, on the other hand, had 46.7% selling at the weekly markets but did so frequently. This could be attributed to the absence of complementary services on the corridor which compel them to travel to Wenchi to access them. The remaining sell at the farm gate or within the community. From Table 4.24 it can be seen that the proportion of farm produce sold by the road side at the intervention period was higher 72.5% of the total produce, which could be attributed to the road improvement which encouraged buyers unto the corridor. The high price could also be a factor. This cumulatively translated into a higher average of farm produce sales along the intervention than the control corridors also indicated in Table 4.24. Households in Nsuhunu took all their maize produced to the weekly market (see Table 4.23) as the poor nature of the road did not encourage buyers as the former corridor. The reason for the high patronage of control communities at the weekly markets could be to get competitive prices which are usually higher than the farm gate prices as noted by Arethum and Bhatta (2012) in their Northern Ethiopia study.

The average travel time to a weekly market on the Intervention corridor was 17 minutes while that along the control corridor was 55 minutes; a difference of about 40 minutes. The distances involved make dependence on motorized transport inevitable as 80% used this mode to access the market whereas only 40% do so along the intervention corridor. This can be explained by the fact that walking was the mode used by 60% of the farmers patronising the daily markets along the corridors.

Availability and reliability of transport services along the Intervention corridors made it easier for rural farmers to access the markets frequently as 57% and 33% of households on the intervention and control corridors respectively were able to access the markets. The usage of the transport services was also linked to the willingness to pay factor on the part of the farmers. Awisa-Atuna had the highest frequency although vehicles were only available on market days or on rental basis. The situation of the control corridor was the opposite as limitation in terms of the nature of road and the unavailability of vehicles make their visits less frequently; 47% as against 24% on the intervention corridor. It could also be explained by vehicles coming in only on market days; with Kokosua 1 & 2 being the highest and less frequently. The poor nature of road along the control corridor could be responsible for this trend. Nana a passenger at Kokotesua explained her frustration if she needs to travel outside the community,

"The sand road with so many potholes, l think is responsible for the limited number of vehicles that ply this road, this situation make life unbearable and difficult if you have to go out to the urban area. It is terrible for women in labour with no vehicle or vehicle but has to move at low speed".

The limited vehicle access due to the road condition also pushes transport fares high. The time spent to travel on the Nsuhunu corridor was too long; 79 minutes to cover a distance of 6.8km while a 7km stretch can be covered within 46.07 minutes.

In summary, a road improvement can be a reasonable cause of the increase in access to markets; particularly external ones. The proportion of goods sold at the farmgate was the highest along the control corridor while the highest along the intervention corridor was sold by the roadside. Patronage of weekly markets was seen on both corridors but the intervention corridor had a higher patronage. Though both corridors took their goods to the weekly markets the distances covered were longer for households along the control corridors than those on the intervention corridor. This implies that the transport burden was heavier on the control corridor than on the intervention corridor. Integration into the market enables farmers have competitive prices for their goods, which in turn increases their profit margin and eventually boost their incomes making it possible for them to meet their basic needs to improve their welfare and the realization of the MDG on poverty and hunger.

Table 4.23. Travel time, mode used, and patronage to markets in the study area

Corridors	Travel time (mins)	Mode of Travel				Freq. to Weekly Market (%)		Freq of Visits (%)					
		Walking		Motorised		Weekly		Not		Less		Very	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Intervention	16.68	164	60.1	393	39.9	518	52.6	189	19.2	238	24.2	558	56.6
Control	55.49	69	20	99	80	105	84.6	25	20.4	58	46.9	41	32.7
Intervention Corridors													
Agona-Wiamoase	11.66	274	75.4	89	24.6	171	47.1	75	20.6	94	25.9	194	53.5
Poano-Ntinanko-Adoowa	15.97	171	68.5	79	31.5	110	44.1	44	17.5	65	25.9	142	56.6
Awisa-Atuna	17.21	104	63.7	59	36.3	76	46.7	29	17.7	31	18.8	104	63.5
Old Drobo-Ponko No.1	28.03	3	1.3	206	98.7	177	84.9	41	19.8	57	27.2	111	53.1
Control Corridors													
Kokoteasusa-Wiamoase	54.78	4	12	33	88	34	92.6	8	22.2	12	33.3	16	44.4
Kokosua No. 1&2	46.07	2	6.1	36	93.9	31	82.8	3	9.1	22	57.6	13	33.3
Atuna-Nsuhunu	78.75	7	50	7	50	13	100	2	12.5	7	50	5	37.5
Aniantetem-Odumase-Amanhyia	59.95	14	34.5	27	65.5	31	75	14	33.3	19	46.7	8	20

Source: Field Survey, March 2014

Table 4.24: Proportion of goods sold at various locations

Place	Control	Intervention	Change	% Change
Farm	85.50	62.89	-22.61	-26.44
Home	87.55	86.21	-1.34	-1.53
Local Market	81.5	86.9	5.4	6.63
Weekly Urban Market	80	88.1	8.1	10.13
Roadside	10.33	72.50	61.87	598.94
X	**68.976**	**79.32**	**12.86**	**117.55**

Source: Field Survey, March 2014

4.7 Other services used by the corridor households

4.7.1 Water Facilities

From the survey, it was revealed that almost all the communities covered along both the intervention and control communities had potable water. Kokotesua was the only community using spring water. The reason had been the difficulty to reach the water table, though different organisations had tried but to no avail. The only community still resorting to non potable water supply was Kofikrom where the facility had broken down at the time of the survey. Obaa Yaa a tenant at Kofikrom explain their water plight at the time of the survey,

"We used to have a borehole but it got spoilt two years ago which has resulted in the community resorting to the use of stream water again. We hope the water company will fix it soon".

The reason for the wide coverage could the presence of Community Water and Sanitation Agency and operations of NGOs like World Vision in the districts studied. It is therefore possible that these areas will achieve the standard for rural areas which is 80% coverage by end of 2015. This observation is a step in the right direction as consumption of good drinking water translates to healthy population and consequently reducing the expenditure on healthcare on both the households and government. The road improvement might have facilitated the wide coverage of potable water provision, in the study areas. The consumption of potable water will make the households healthy to work hard for income which will enable them improve their welfare and finally enhance the achievement of the MDGs generally and the health sector particularly.

i) Number of trips to water points and frequency of visits

Water collection is usually a daily phenomenon. The study confirmed this as households on the intervention corridor had 90% of households collecting water daily with 86.7% doing so very frequently, while 96% on the control corridor collected water daily with 90.7% also fetching water very frequently. Maa Koma a parent commented on the daily water collection, *"My children need to collect water twice a day, first in the morning before school and in the evening for cooking. This is done because l do not have a barrel to store a lot of water."*

This is usually the trend because most households do not have large containers to store up the water so turn to collect what is needed in a day at every point in time. For the women and children, this act was a form of socialization so that meeting frequently is desirable. Time spent and the mode used is also relevant for discussion.

ii) Mode used for the water collection

From the study, it was revealed that walking was indeed the predominate mode used for the collection of water as 99.1% and 98% of households employed this on the intervention and control corridors respectively. Those on the intervention corridor spent on average about 5.8 minutes whereas the control corridor households used 7 minutes on the average to collect water. Households on the Old–Drobo–Ponko 1 corridor had the shortest time of 4.1 minutes while Awisa–Atuna corridor households took 7.3 minutes (one way) to collect water at a point in the community. Mumuni a mother along the control corridor was more than happy to have water,

" Now we have pipe water which is very clean within the community but because it is only one and at the centre of the community my children have to walk longer distance to reach and queue in the mornings and evenings to fetch, though long l think it is shorter than the stream we used to fetch from."

The control corridor communities had longer distances to cover as those in Kokotesua took 12 minutes to collect water as Aniatetem corridor used less time of 4.3minutes. The difference in time spent could be attributed to the limited water points within a community and break down of some borehole or both.

4.7.2 Firewood Consumption

Energy is essential in all locations but more so, in a rural setting. Energy for cooking is always the critical one. From the survey, all the road corridors used firewood for cooking. On the average, it took women and children 35 minutes and 30 minutes (one way) on the control and intervention corridors respectively to travel to farm locations and on the average

60 minutes to search for the firewood. The total time spent is above 240 minutes. This time is wasted as it was not used for any productive activity (Edmonds, 1998). This trend is challenging as this activity is carried out mostly on daily basis as 75% of households execute it daily on the control corridor with 55% on the intervention corridor.

4.7.3 Source of Firewood

On the intervention corridor, the highest average time spent was on the PNA corridor which recorded 40 minutes and 24 minutes on the Agona-Wiamoase corridor; while the control corridor had the highest record on the Kokoteasua corridor of 45 minutes and lowest on the Nsuhunu corridor of 16 minutes. The limited time utilized on the Nsuhunu corridor could be attributed to the settlement pattern which was dispersed thus allowing women use their limited time to search, gather and then head load the firewood to their respective houses. Another reason could also be the frequency and daily search which means the quantity required could be limited compared to other corridors where the activity was not pursued daily. Mansa maame, a trader added to the firewood dialogue,

"l use firewood if l go to the farm, other days l buy charcoal, but use it sparingly because of the cost, but the firewood is free. l a times hire a vehicle to fetch the firewood since the road improvements."

This exercise is also carried out through walking confirming Porter's (2002) assertion that ―rural people inhabit a walking world‖. Reduction in time used for the collection of firewood can be utilized for productive work, and the transport burden on women lessened. Transport services and the infrastructural elements among others on the various corridors is next assessed.

4.8 Transport Infrastructure and Services in the Study Areas

Transport infrastructure and services are important as they enable people move between locations of need to meet their basic needs like health and education. This in turn will help improve the well-being of rural folk particularly and the realization of the MDGs eventually. There are several studies which confirm this (World Bank, 1994 and Kerf and Smith, 1996). The authors argue that efficient infrastructure and services improve access to basic services and boost productivity of the poor through lowering transaction and production cost. The transport infrastructure state for the various corridors is first discussed before assessing the transport services along the study corridors.

4.8.1 Transport Infrastructure in the study area

Rural transport infrastructure spans from paving a road, surfacing, providing footbridges and installation of culverts, footpaths and tracks. The provision of these infrastructural facilities can be very challenging particularly in the study areas. In terms of transport infrastructure the intervention corridors were better served than the control corridors, which have implications for the welfare of the households and the achievement of the MDGs.

Of the four corridors studied, all were initially in deplorable conditions having earth and gravel surfaces as indicated in Table 4.26. Two of the corridors; Agona-Wiamoase (12km) and Old Drobo-Ponko 1 (3.4km) are bitumen surfaced presently, while the PoanoNtinanko-Adoowa and Awisa-Atuna corridors are gravelled. The road condition mix presented has limited information (see Table 4.25) but the Wenchi Municipal Assembly seem to be doing well as its roads in ―good‖ condition (58.6%) exceed the national figure of 45% (MRH, 2014). The feeder roads technician explained the roads situation in the Wenchi Municipal during the institutional survey,

"Though the municipal has appreciable good roads, those in poor state remains high, we hope in the coming years funds could be made available to rehabilitate them"

The Bekwai Municipal Assembly on the other hand had 35% of its roads in ―good‖ condition, though lower than the national figure which is being compensated for by the ones in ―fair‖ condition as the municipal‘s figure (40%) was higher than the national figure of 25 (MRH, 2014). Though the municipality seems to be doing well, villages especially those on the control corridors, need to be looked at to enhance their access to basic facilities. This is because the figure for poor roads needs to be improved upon as these roads are usually found in remote rural areas which connect households to areas of interest to improve themselves and aid the realization of the MDG on poverty.

Table 4.25. Road Condition Mix of the study Districts

District	Road Corridor	Good	Fair	Poor
Wenchi	Awisa-Atuna	58.6%	-	-

	Atuna-Suhum			
Bekwai	Poano-Ntinako-Adoowa	35%	40%	25%
	Aniantentem-Amanhyia-Odumase			
Jaman North	Old-Drobo-Ponko No. 1	-	-	-
	Kokosua No. 1& 2			
Sekyere South	Agona-Wiamoase	-	-	-
	Kokoteasua-Wiamoase			
National	-	45%	25%	30%

Source: Field Survey, March, 2014 (Bekwai Municipal and Wenchi Municipal DMTDP, 2013); MRH (2014)

The impact from the investment is seen in the number of vehicles plying the corridors which have increased from the baseline situation, especially on the Agona-Wiamoase and Old-Drobo corridors. The increase, however, is substantial on the Agona-Wiamoase corridor as the ADT recorded more than 70% increase over the baseline figure as shown in Table.4.26.

Table 4.26: Road Surface Type and ADT at the Baseline (2005) and Intervention periods

Corridor	**Surface**		**ADT**		**Difficulty in Accessing the Road**	
	Before	**After**	**Before**	**After**	**Before**	**After**
Agona-Wiamoase (12km)	Gravel	Bitumen	265	425	Rainy season	-
Poano-NtinankoAdowa (9.5km)	Earth	Gravel	15	25	Rainy season	Portions after the rainy season
Awisa-Atuna	Earth	Gravel	14	6	Rainy season	After the rainy season
Old Drobo-Ponko 1	Gravel	Bitumen	7	27	Portions of the road in rainy season	-

Source: Field Survey, April, 2005 and March 2014

The road improvement on Agona-Wiamoase and Old Drobo-Ponko 1 corridors, were beneficial as periods after the road improvement had no record of road closure as was the case before the improvement especially during the rainy season, as indicated in Table 4.26. The improvement in roads as indicated by a passenger Darkoa has so many impacts on our lives here at Old Drobo in the Jaman North District,

"Before the road improvement it was difficult getting to the market, health centre and to locations outside this community to engage in other activities aside farming, we are grateful

to the government for this. Now am on my way to buy bathroom slippers to sell in the community"

The multiplier effect of road improvements in this study is confirmed by Dercon and Hoddinott (2005) in their study by observing that, increases in road quality have strong positive growth effects.

Road users and vehicle operators gained as cost of operations decreased due to the road improvement. Transport cost was reduced for both passengers and freight on the intervention corridor compared with the baseline transport cost and the prevailing cost on the control corridors. Adowa a market woman who purchase farm produce from different locations in the Sekyere South District had this to say,

"Before the Wiamoase – Agona road improvements l used to pay very high amounts as a passenger and for the goods to transport them to Kumasi, but since the improvement the goods cost has reduce, though l still pay huge amounts to transport produce from Kokotesua along the control corridor due to the poor nature of the road".

The transport services witnessed an increase on all the corridors except the Awisa-Atuna which recorded a sharp decrease in the average daily traffic (ADT) from 14 before the rehabilitation of the corridor to 6 vehicles after the intervention. This was a clear indication of the deteriorated nature of the road at the survey time nine years after the improvement to conditions worse off than before the improvement. This could be attributed partially to the neglected maintenance, since there has not been any maintenance after the rehabilitation in 2005, as indicated by the community level survey, though the Department of Feeder roads officer indicated otherwise.

Table 4. 27 Average Walking Time (Minutes) to Various Facilities along the corridors

Corridor/ Facility	Education (Mins)	Health (Mins)	Market (Mins)	Firewood (Mins)	Water (Mins)	Rural Access Index
Intervention	9.99	25.58	16.68	30.01	5.81	20- 25

Control	27.53	61.82	55.49	35.28	7.09	20- 25
Intervention Corridors						
Agona-Wiamoase	8.99	15.73	11.66	24.24	6.42	20- 25
Poano-Ntinanko-Adoowa	8.10	41.30	15.97	39.53	4.77	20- 25
Awisa-Atuna	15.02	29.80	17.21	30.87	7.30	20- 25
Old Drobo-Ponko No.1	9.54	14.66	28.03	26.70	4.14	20- 25
Control Corridors						
Kokoteasusa-Wiamoase	6.64	70.21	54.78	45.20	11.94	20- 25
Kokosua No. 1&2	18	22.30	46.07	38.70	6	20- 25
Atuna-Nsuhunu	110	124.29	78.75	15.56	8.25	20- 25
Aniantetem-OdumaseAmanhyia	35.45	76.05	59.95	29.54	4.36	20- 25

Source: Field Survey, March 2014

Another aspect of the rural road infrastructure assessed to determine whether households have minimum access was the application of the Rural Access Index recommended by the World Bank as explained earlier in Chapter Two. For the purposes of this study using the 2km measure was problematic so the researcher depended on the travel time of between 20-25minutes to a road. The average travel time to access the basic services in the study areas are thus presented and briefly discussed. Evidence from the field revealed that, households had peculiar challenge with regard to firewood collection and access to healthcare as shown in Table 4.27. Households on the intervention corridor used 30minutes on average to collect firewood and 25 minutes to access healthcare. Conversely, the households along the control corridor with the exception of water used beyond the 25 minutes cut off point to access all the other facilities, with healthcare being the worse as over an hour is spent on average to access these facilities (See Table 4.27). Nsuhunu and Kokotesua are the worse locations to access healthcare along the control corridors.

All rural people require is to have basic access to roads which should be motorable all year irrespective of the weather condition, so they can access important places of interest like the markets, schools, health facilities to mention a few. Transport investment then becomes important as its provision makes these dreams of the rural folks a reality and enhances their well being. The transport services used by poor households on the study corridors is delved into to appreciate how their mobility is met to access facilities to improve their lives and ultimately the realization of the MDGs.

4.8.2 Transport Services

The transport services used along the study corridors include: motorized (taxis, motorcycles, tricycles (aboboyaa), trucks and; non–motorized (bicycles and head loading) and walking. Walking was singled out because in the study areas most activity access is by this mode of transport. The field data indicate variation in modes along the corridors. These have been presented in Table 4.28. From the table, the modes used during the baseline situation were not in a good state, as old and rickety types were used. This view was confirmed by some key informants along the intervention corridors and the focus group discussions as wellas some transport operators. Mr K Y a transport operator explained the situation further at Awisa Taxi Station,

" When the road was in a bad shape most vehicles avoided this road, the few vehicles were in very bad state, when it is raining and you are in such vehicles you can get wet, but with the improvement good vehicles have come here to operate to reduce their operating cost."

This situation could be related partly to the poor nature of the roads before the rehabilitation in 2005. Low demand along the corridor during the baseline situation could also offer another explanation to the use of the transport modes. The control corridor also exhibited similar characteristics. Paradoxically, the services used by households along the intervention corridor not only had variety but were in a good state too as was seen in the study communities and along the corridors at the time of the field data collection.

Table 4.28: Mode of transport used along the corridors

Baseline		**Control**		**Intervention**	
Mode	**Number**	**Mode**	**Number**	**Mode**	**Number**
Pickup	16	Mini & medium trucks	50	Mini & medium trucks	265
Walk	40	Walk	13	Taxis	85
Bicycle	2	Bicycle	3	Motorcycle	50
Head loads	21	Head load	6	Tricycle	20
Rickety trucks	4	Taxis	26	Bicycle	163
Rickety taxis	3			Walking	401

Source: Field Survey, March 2014.

Generally, the means of travel recorded an increase after the improvement to the corridors. For instance, the households at the baseline used pick ups but there were absent at the intervention period. Rickety vehicles had been replaced by non- rickety ones as shown in

Appendix 4.6. In terms of numbers there were more vehicles and variety at the intervention period. A passenger Kofi, at Ponko 1 an intervention corridor commented on the transport services situation during the focus group discussion,

"If you want to travel from this community presently, you have so many options of vehicles to choose from taxis to trotros (both small and medium) but previously it was only an old pick up we had access to. I know it is good to have good roads, if you do not even have a facility within the community you can travel to it with the different vehicles and within a short time too."

The control corridor had limited number of motorised transport, which could be related to the nature of the road serving as a deterrent to the transport operators. The high number of transport vehicles is also related to the ADT in Table 4.26 where the figures for the intervention were higher than the baseline. For example Agona – Wiamoase corridor had 265 vehicles per day which doubled at the intervention period. Conversely, corridors with no maintenance rather recorded low ADT at the intervention (Awisa-Atuna corridor). Availability does not always guarantee usage as Poano- Ntinanko- Adoowa corridor had highest numbers of vehicles plying the road but usage was low.

This phenomenon can be related to the high tariffs along the PNA corridor. This implies that the provision of infrastructure needs to have affordable services to enable its full benefit to road users. Cost of accessing motorised transport was thus a factor inhibiting the fully utilisation of the corridor by households to realise the MDGs.

Non- motorized transport use for travelling was again higher along the intervention corridor than the control corridor as shown in Table 4.28. The only ones in use in the study area were bicycles. It was however surprising that, this mode of transport were limited along the control corridors as DFID (2003) has shown that these means of transport operate well along the control corridor type of road rather than the intervention road.

The last of the means recorded in the study communities was walking, which was significant along both corridors though it was substantial along the intervention corridors.

The limited number recorded along the control corridors was not expected as most activities in and around the villages are mostly executed through walking.

Though households on both corridors walked, the households on the control corridors had a higher burden than their counterparts along the intervention corridors. The distances travelled by household on the control corridors could be because facilities are located outside the community or are far off from their residential locations. For longer distances above 20km, motorized means of transport were utilized. Marima a native of Nsuhunu explained further,

"Leaving here is so difficult wherever you go to take ages, whether walking to fetch water or travelling in a vehicle to the market of hospital".

For example, the average walking distance was 18km along the control corridor as shown in Table.4.28 while the intervention corridor average stood at 13.6km. Aniatetem – Odumase - Amanhyia corridor had the highest walking distance among the control communities at an average distance of 20.94km (see Table 4.29). Though the distances were far off on both corridors the control corridor households had a greater transport burden. This finding is in support of Starkey et al. (2002) who recommended motorized transport for any travel beyond 20km.

Table 4.29 Average Distance by Mode of Travel along road corridors (for all purposes)

Corridor	Foot/Walking (km)	Motorised (km)
Intervention	13.60	22.31
Control	18.11	27.57
Agona-Wiamoase	12.90	19.54
Poano-Ntinanko-Adoowa	15.16	20.13
Awisa-Atuna	13.76	25.31
Old Drobo-Ponko No.1	12.59	24.24
Kokoteasusa-Wiamoase	17.73	22.21
Kokosua No. 1&2	14.84	24.40
Atuna-Nsuhunu	18.89	26.34
Aniantetem-Odumase-Amanhyia	20.94	24.78

Source: Field Survey, March 2014.

Table 4.30. Distances Travelled by households along the corridors.

Corridor	0-2 km		2-5 km		5-8 km		8+ km		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Intervention	68	6.9	125	12.7	385	39.1	407	41.3	985	100
Control	2	2.03	11	8.59	53	42.51	58	46.87	124	100
Agona-Wiamoase	15	4.1	42	11.72	123	33.88	183	50.30	363	100
Poano-Ntinanko-Adoowa	4	1.79	13	5.31	103	41.09	129	51.81	250	100
Awisa-Atuna	1	0.62	8	5.02	51	31.15	103	63.21	163	100
Old Drobo-Ponko No.1	6	2.68	20	9.44	71	33.92	113	54.03	209	100
Kokoteasusa-Wiamoase	1	3.06	4	11.55	12	32.07	20	53.32	37	100
Kokosua No. 1&2	1	2.81	2	5.22	12	31.92	22	60.05	37	100
Atuna-Nsuhunu	1	3.55	1	9.49	3	24.1	7	62.86	12	100
Aniantetem-Odumase-Amanhyia	1	2.13	3	9.01	12	30.72	22	58.14	38	100

Source: Field Survey, March 2014.

In assessing the distances travelled, the longest distances travelled on the control and intervention corridors were 8km and above, as 46.8% and 41% travelled over this distances on the control and intervention corridors respectively, as shown in Table 4.30. The reason for the long distance travel along the control corridors is possibly because they lack a number of basic services. Conversely, households on the intervention corridor, on the other hand, may be doing so because they have ready access to vehicles and thus are able to travel longer distances to enjoy services outside their communities. It is also possible that households along the intervention corridor may be searching for quality service because they have access. This implies that households on the intervention corridor have improved mobility as confirmed by Bryecesson et al. (2006), where the authors found improved mobility in Zambia and Vietnam but improved accessibility in Ethiopia from their Africa and Asia study.

The road improvement along the corridor and the regular maintenance could be cited as the reason for the transport services availability and reliability enjoyed by the households, which also translates into reduced travel time and waiting time as indicated by the transport operators, the households and at the focus group discussions held with communities along the corridor. Consequently, these actions increase the activity base on the corridors in general. The activity levels was also seen in the number of vehicles plying the corridor, at the baseline the ADT was 265 but the present study recorded about 80% increase over the baseline figure. But cost of travel using motorised means of transport limited the access households could have to facilities to enhance their lives and help the achievement of the MDGs. Locations off the main corridor had less activity as the road condition is very bad. For instance Kokotesua is only 9km from Wiamoase but it takes on average an hour and half to travel that distance due to the poor nature of the road.

Summary

After analysing the field data the key areas looked at four main levels as follows:

1. Socio- economic characteristics along the study corridors and how this have been shaped by road investments
2. Household incomes and expenditure along the control and intervention corridors

3. Access, mobility to and use of facilities and services with emphasis on education, health and market.
4. Nature, quality and types of transport infrastructure and services along the study corridors.

In all of the above it has been seen that, road improvement impacted positively on communities along those roads and was evident in the diversity in employment, incomes earned and increased consumption which has impact on the achievement of the MDGs 1. Access to facilities saw improvement for treated corridors with a contrary situation seen along the other side. Road type and quality in terms of regular maintenance encouraged diverse transport services, which led to mixed impacts though some improved corridors witnessed transport services reductions.

After analyzing the field data the summary of findings and subsequent discussions are presented in the following chapter as the impacts on the road corridors are also further discussed to appreciate how the improvement of the roads have helped the achievement of the MDGs or otherwise.

CHAPTER FIVE

SUMMARY OF MAJOR FINDINGS AND DISCUSSION

5.0 Introduction

The preceding chapter presented the field data and analysed them under the following distinct headings: economic activities, household income and expenditure, access to basic life sustaining services as well as transport infrastructure and services. The objective was to assess the impacts of rural road investments on transport services and, consequently, on rural households‘ access and participation in economic and social activities to boost their welfare which will eventually get them out of poverty. This will subsequently lead to the realization of the MDGs. This section of the study, therefore, seeks to present the main findings from the analyses and situate them within global discourse. The findings will also inform policy makers on the issues which directly address rural people‘s access problem on the study corridors and other similar corridors in Ghana.

5.1 Impact of Road Investment on Agricultural Activities

The impacts under agricultural activities have been grouped into two, namely: access to inputs or the factors of production and the effect of these inputs on production levels.

5.1.1 Impacts of Road Investment on Farm Inputs Access

Accessibility to improved rural roads was found to impact positively on households' use of inputs. The proportion of farmers using farm inputs was higher on the intervention corridor than those on the control corridor. For instance, 114 farmers used fertilizers on the intervention corridor with only 17 doing so on the control corridors. This phenomenon could be attributed to the improvement to the road corridors, which enhanced transport services and made it easier for households to access input markets at lower transport cost. The frequent supply of inputs meant reduction in prices which enabled farmers purchase more. The reduction in transport cost and cheaper prices of inputs will lead to less expenditure on the factors of production which implies that households will have more income to spend on other essentials to improve their welfare. Another probable explanation could be due to the information and improved technologies households on the intervention corridors enjoyed from extension services as they had increased contacts, which was twice per month as compared to once along the control corridors as presented in the preceding chapter.

Although, usage of inputs was lower on the control corridors, the price paid by households was 40% higher than those on the intervention corridors. Not only was the prices of inputs expensive to households on the control corridors, they also paid more to transport the inputs between the market and their respective communities. For instance, transport cost per km for a 50kg bag of fertilizer cost 0.35p more on the control than the intervention corridors. The reason could be related to the location of input shops along the intervention corridor, which was made possible with the rehabilitation of the road. Again, the reliability and availability of transport services facilitated farmers' access to input markets. Liu (2000) also confirms the economic impact of lowering transport cost which enhanced production levels on the all-weather access road compared to the seasonal access road in the State of Andhra Pradesh, in India. The transport cost per tonne km for inputs was lower on the good access road than the bad access road, as a bag of fertilizer cost US$.0.16 by lorry on the good access road but cost US$. 0.25 for unconnected households. The present study witnessed a similar fate where the intervention corridors paid less for inputs cost per tonne km of fertilizer 0.30p

(US$ 1.20) on the intervention corridor compared to 0.65p (US$2.60) on the control corridor by taxi. Though both studies used motorised means of transport for the haulage, the difference in capacity could be a possible reason for the price differentiation.

Arethun and Bhatta (2012) also confirm this finding with their Northern Ethiopia rural roads study, which showed a higher proportion of households using purchased inputs on the good access roads than those on poor access locations. In terms of quantities of inputs usage, there was no significant difference on both the good and poor access roads, but prices paid for the inputs were 17% higher for households with poor access. The distances and nature of the roads and other uncontrolled factors at the different locations could be a probable reason for the observed difference. The poor nature of the road implies limited supply of transport services resulting in increase cost of transport to households. Another contributing factor was the longer distances households on the control corridor had to travel to input markets. Whereas the Ethiopia study showed no significant difference in the quantities used on the different road types the present study showed marked differences in quantity used on the different roads.

The consensus from the studies reviewed on the high transport cost placed on the poor access corridors could be explained by the limited supply of transport services; therefore pushing the transport cost up. The level of road deterioration and neglected routine maintenance could be cited as an explanation for the limited supply of transport services which in turn results in high transport cost along the control corridor.

Bhalla (2000) found that transport cost reduction affects the factor price of production to decrease, resulting in increased demand for inputs at reduced price to boost productivity of farmers which in turn increases their revenue from agricultural activities according to micro economic theory. A similar study by Holm- Hadulla (2005) also revealed that improved rural roads enhance access to input and output markets and non- agricultural jobs. In advancing this line of argument, Stifel and Minten (2008) revealed that the improved road not only reduces input cost, but also enhances the timely arrival of inputs which result in high productivity. This was the situation found along the intervention corridors as speeds to the input and output markets were higher which facilitated timely arrival of inputs to the intervention communities. Ahmed and Hossain (1990) further confirm this with their Bangladesh study where peasant farmers with good access and improved transport services experienced low transport cost enabling them use more purchased inputs like fertilizers, seeds and herbicides in terms of quantity and value. It is likely that the improved access to extension services could be a factor for the use of the inputs, though the road improvement facilitated their visits.

From the forgoing, it can be inferred that improved roads enhance transport services operation which in turn reduce transport cost and speed to access input and output markets. This better access enable farmers purchase more inputs at lower cost to boost their productivity and production in some of the studies. Irrespective of the location, magnitude, methods used and time of the project the impacts from the other studies seem to present similar results of the impacts. The magnitude of the present study seems to be higher as the corridors selected where in four different districts within two regions. This boosted households incomes and better placed these households in a position to address their poverty and hunger. This therefore implies that road improvement is a precondition for poverty reduction; particularly, in areas which were isolated, as their connectivity to outside locations enables them to improve their welfare and the achievement of the MDG on employment.

5.1.2 Impact of Road Investment on Output levels

The study found improvement in overall agricultural operations with increases in land productivity, volume of production and the revenue from output. These increases were high on the intervention corridor compared to the control corridors. For example, there was a 58% increase in maize production along the intervention corridor over that of the control corridors. Another economic impact was seen in the increase in the land used for cultivation of the major crops. For instance, land used for cultivation of cassava witnessed an increase of 80% along the intervention corridor as indicated in the analysis chapter. This situation could be attributed to the road investment which improved access to input markets to boost land productivity and production. Access to output markets where demand was higher could be the push factor to cultivate more to meet the demand, which also means higher prices at the weekly and urban markets, or both.

Arethun and Bhatta (2012) support the foregoing view with their study that suggest that rural accessibility improvements enhance access to, and participation in, market which lead to increased agricultural production and incomes. Advancing this line of argument, the authors noted that improved prices of farmgate produce on the good access roads, also encouraged production. This finding is consistent with findings from the current study as this was the case on the intervention corridors, particularly the Agona –Wiamoase corridor, where higher prices of farm produce along the corridor boosted production levels as was evident from the household surveys which were affirmed during the focus group discussions. Dercon et al. (2007) added that, if the major economic activity is agriculture, then, improving the roads has the ability to boost productivity through cost of inputs and higher output prices. Hettige (2006) found similar evidence of the impacts of rural road investment on rural communities, with studies across Asia, specifically; in Indonesia, Philippines and Sri Lanka. These studies revealed that improved roads present a mix of transport services, reduce travel time and increase in traffic volumes. He also found that buyers get attracted to such roads which increase the price of farm produce and boost small businesses. There were however differences in transport fares which depended on the competition prevailing in the market at any point in time. The current study, also found difference in transport fares as fares along the control corridors were higher due to the limited supply of transport services but the opposite was the situation along the intervention corridors. The present study in addition found differences in price of the different motorised modes of transport along the intervention corridor.

Ahmed and Hossain (1990) also confirm the forgoing finding from their 129 communities village study in Bangladesh which also found that villages with better access to roads had greater agricultural outputs and higher incomes than those with poor road access. Binswanger et al.(1993) also revealed with their study of 85 districts in 13 states in India, the positive impact of investing in road infrastructure as it boosted agricultural output, increased fertilizer use and credit supply. Similarly, Windle and Cramb (1997) corroborate the finding that, improved accessibility to markets in three areas in Malaysia impacted positively on farmers as it resulted in increases in Hill padi production. Likewise, empirical evidence from Morocco found that rural roads investment resulted in higher agricultural outputs, rise in the use of modern inputs especially fertilizers and improved agricultural extension services (Levy, 2004). Another study in Ethiopia reports of a similar finding where access to improved roads was one of the factors which determines farmers usage of fertilizers; among others. Those with access to an all –weather road had a higher probability of fertilizer adoption which increased by some 15- 20% depending on the region than any other factor (AU/UNECA, 2005: 13). Khandker et al. (2006) also support this with evidence from Bangladesh where large increases in agricultural production, output prices and wages coupled with reduction of input prices and transport cost were recorded with improvement in rural roads. Dercon and Hoddinott (2006) also recorded similar findings.

Though investment in rural roads has the potential to propel economic growth as asserted by some studies, the reverse could also happen. Jacoby‘s (2000) study of Nepal found that improved access resulted in higher productive capacity of poor households but impacts of the roads on poverty reduction were limited. Escobal and Ponce (2003) found no significant impact of improved roads on agricultural production, income and poverty in rural Peru. This was the trend on one intervention corridor, Awisa – Atuna where no impacts emerged as at the time of the survey, nine years after the intervention. The reason could be the neglected maintenance as it was the only intervention corridor on which no maintenance had been applied since the 2005 RSDP project. Raballand et al. (2010) have also cautioned that, although transport cost reduces with improved road infrastructure, returns to road investment can be a challenge particularly in Africa where because of low productivity and low commercial surplus by smallholders result in under-utilization of roads coupled with the unstable transport services delivery. This confirms the finding from the present study, as some of the corridors were experiencing this trend. A good case is the Poano- Ntinanko-Adoowa corridor where unstable transport services heightened the transport cost as a result of which 70% of farm produce was sold on the corridor instead of being taken to the weekly markets.

In spite of the diverse views on how road investment impacts households from the different studies, the findings from this study emphasize the importance of road investment in rural areas, as this leads to efficient and affordable transport services which propel the needed economic growth. This is because the positive impact of the road enhancement affects diverse areas including; land productivity, access to farm inputs which impacted directly on volume of production and revenue derived from output sold along the improved corridors in relation to the poor access corridors is an indication that accessibility enhancement helps rural poor people to participate in economic growth which has the potential to improve their welfare and place them in a better position to fight poverty. The difference between this study‘s finding which makes it stand out is the fact that it uses output figures for the baseline, intervention as well as the control corridors to compare, making the assessment richer than what the other studies reviewed.

5.2 Impact of Transport Investment on Household Incomes

Rural road investments have affected beneficiaries of the corridors in different ways. Improved accessibility will lead to reduction in total cost and other factors of production which can increase productivity and production. The increased production means higher profit margins for farmers as farm produce will have higher prices at the competitive markets, thus increasing incomes for farmers.

As incomes increase, it is possible that farming activities can be displaced by non-farm activities which normally emerge on improved corridors or shift from farm activities to earn higher incomes. Communities along the intervention corridors enjoyed this emergence and some households have started trading in used clothes, food and manufactured items; among others. The rehabilitation also saw the introduction of industrial and other products which might be cheaper to compete with agriculture produce.

Escobal and Ponce (2002) found that for agricultural incomes to be sustained there must be other complementary facilities like access to credit, available farmland, education, electricity and telecommunication which can affect the expected impacts. Binswanger, Khandker and Rosenzweig (1993) hold a similar view that productivity and agricultural incomes depend on complementary interventions such as technical support and access to credit. The present study found increase in incomes from both agriculture and non – agriculture activities, but incomes from the latter were higher on the intervention corridor whereas the control corridor had higher income from agriculture. Evidence from the field shows that for agricultural incomes to be sustained there should be complementary services such as access to inputs, available land, extension services and access to markets.

From the field survey, the road improvement could be used as an explanation for the fair distribution of incomes along the intervention corridor as indicated in preceding chapter, where all income groups had around 30% of the corridor incomes. Conversely, the control corridors presented the opposite as two thirds of households earn between GH¢ 0-300 per month as compared to a third on the intervention corridor. This could be related to the road enhancement which has helped connect rural households to employment areas to boost both agriculture and non – agriculture activities. Holm- Hadulla (2005) asserts that for transport investments to affect the poor they need to address their employment needs to impact on economic growth but the growth needs to be channeled well to reduce inequality. In line with this argument, Ravallion and Chen (2003) suggest that this growth needs to reduce poverty by some agreed measure. Though, Holm – Hadulla (2005) presented the inequality stand of the present study provided empirical evidence to confirm his assertion as the extent of inequality among the corridors surveyed was a clear indication of the improved road which has helped to distribute incomes fairly.

From the forgoing, income sustenance irrespective of the geographical location of the corridor depends on a number of factors such as households' access to inputs, land, technical support, education, telecommunication, markets and credit facilities. Whereas the Peruvian study had education and electricity to be one of the factors necessary for income sustenance the present study did not. Again, the methods applied in the Peruvian study differed from the present study but both found similar results.

The study's assessment of the impact of the road improvement on poverty and hunger is thus found to be addressed adequately as the increase in incomes will help to reduce the poverty through increased consumption as expenditure on food placed second on both corridors surveyed.

In summary, it can be inferred that the effect of road investment on incomes is a difficult issue. The study's selection of intervention and control corridors, made it possible to compare the incomes of households on both corridors. The results indicate that households on the intervention corridors received an average income of GH¢74 higher per month than the households on the control corridor. This implies an increase of 32% of the average income of households on the intervention over those on the control corridor. This finding is in conformity with Escobal and Ponce's (2002) study in rural Peru, where the increase in incomes along the good access road showed a 35% increase in incomes over that of the poor access road. It is important to mention that the intervention corridor's access to certain services could have influenced the high income as there were complementary services like electricity, improved education, and better access to health and improved access to markets than those on the control corridors. It is likely that the rehabilitated roads coupled with these complementary services could be the factor for the increased welfare found.

The results of this study suggest that the increase in non-agricultural incomes along the intervention corridor could be attributed to the road rehabilitation as the control corridors did not exhibit that character. This finding is consistent with Javry and Sadouldt's (2001) study in Mexico and Corral and Reardon (2001) in Nicaragua as well as findings of studies by Escobal and Ponce (2002) in rural Peru and Yewstov and Losshin's (2005) study in rural Georgia. Gachassin, Najman and Raballand (2010) also found with their Cameroonian study that road improvement better enhanced productivity and incomes from non-agriculture incomes as rural inhabitants had the opportunity to move out to these employment centres. The present study's finding on the enhanced employment in the non- agricultural sector was evident along the corridor and not outside the road catchment as presented in both the Cameroon and Peru studies reviewed. However, the Georgia study also found high numbers of women participating in the non-agricultural sector as the present study, but this was not explicitly stated in the other studies.

Given that the remote areas have excess labour market, road improvement can be said to boost non-agricultural employment. Unfortunately, there are no data to compare the incomes of these activities before the road rehabilitation to establish the actual increase, but indications from the focus group discussions seem to imply that incomes from the activity were lower during the baseline period. Studies holding opposing view to the increase in non-agricultural incomes include Escobal and Ponce (2002) and Jacoby (2000). Both studies found increase in incomes to be the result of the time allocated to the activity and not mainly the rehabilitation of the road, to boost incomes.

From the forgoing, it can be inferred that road improvement enhances income in agriculture and non- agricultural activities. Gachassin, Najman and Raballand (2010) in their study of Cameroon were not explicit on duration of work for non- agricultural activities neither were the incomes of the activity recorded before the road rehabilitation to ascertain the difference. Escobal and Ponce (2002) as well as Jacoby (2000) were the only ones which measured the time allocated to the activity. The present study did not capture the duration of the income generation activity but rather concentrated on the physical access of rural people to the facilities and economic ventures engaged in to improve their welfare and the MDG on employment and social services.

5.3 Impact of Transport Investment on Expenditure/Consumption

To address the hunger side of MDG one, the consumption levels of households is an important variable. The comparison of the expenditure patterns of households on the intervention and control corridors suggests that increased incomes from gainful employment from the study area are largely consumed. The expenditure patterns, presented an interesting scenario because though control corridors had lower incomes, their consumption levels were 8% higher than the intervention corridor‘s expenditure. This implies that incomes earned are spent on items deemed essential to enhance the growth and welfare of households. To analyse this, the Spearman‘s Rank correlation was used, as shown in Appendix 5.1.

When the Spearman‘s Rank correlation was used to determine the variation in expenditure along the corridors, it was revealed that the variation was insignificant, as it had a Spearman rank correlation coefficient (rs) of 0.92 which implies there is virtually no difference at the aggregate level between the pattern of expenditure on both corridors.

The analysis however revealed the importance households on the respective corridors attach to the items indicated. The items indicated in Table 4.1 in the analysis chapter gave an indication of the items critical for the achievement of the MDGs which is confirmed by the Spearman‘s Rank correlation. For example, farm inputs ranked first on both corridors, depicting the desire for the households to invest in their economic activity which was basically farming to earn incomes to be used in accessing their other needs. Though this expenditure was first on both corridors the burden placed on households along the control corridor was high in comparison to the incomes they receive from the activity. Food placed second, addressing the hunger part of the MDG one, the high cost incurred on food items is an indication that households are able to meet their hunger needs as this is of a high importance than other items. This coupled with the foodstuffs consumed from their farms addresses the hunger part for the households and thus improves their lives.

Surprisingly, transport expenditure on the control corridor was not among the top six expenditure items. This may be due to the other items being higher than the amount spent on transport. Though, both corridors were found to spend heavily on the MDGs items (economic activities, health, education) to improve themselves, the burden placed on the households living in communities along the control corridor was heavier in relation to their incomes. Average monthly incomes of GH¢ 229 was earned along the control corridors compared to GH¢ 303 on the intervention corridors. Households on the control corridors spend on average GH¢ 435 per month, which is 8% higher than the amount spent by their counterparts along the intervention corridor per month though they earn higher incomes.

A further disaggregation of the data, however, presented significant differences between both corridors. For example, the control corridor had variations in expenditure items such as transport, funeral/social events, health, fuel, capital items, and water and electricity. This shows the importance they attach to these items.

Transport cost was of utmost importance to households in remote areas because of the scarcity of transport services as revealed by field data, because they had access to transport services weekly or on hire basis to either convey passengers or freight. This implies that the service is valued by households and therefore may be prepared to pay any amount to access it to reduce their isolation.

Expenditure on funerals and other social activities like naming ceremonies also presented a high cost. Literature has shown that rural dwellers perceive this as a form of socialization and the expectation of society is for all to participate to show solidarity and friendship. Dennis (1998) found that the transport cost on social events increases with increase in incomes. The present study found the opposite as households along the control corridor rather had low incomes but expended more on the essential activities including social activities. Participation has cost implications as activities organized demand both human and financial resources.

Health which represents the state of being of an individual is equally important as it affects productivity. The study showed that the average transport cost in accessing health facility was more expensive on the intervention corridors than along the control corridor. The study did not assess the cost of accessing the facility and quality of services. The transport cost was the only variable assessed in terms of physical access, though the economic access to resources influence physical access to an extent. This is because if transport services are available and people cannot afford them then their accessibility would be impeded. Therefore, for households along the control corridors access to healthcare implies a greater cost burden because of the limited transport services that ply such roads, raising the cost of transport. This notwithstanding,under emergency situations that remains the only option to them or walking which was mostly used in the absence of motorized transport to convey them to the health facility.

Water is essential in everyday life of households. Unfortunately, the carriage is a preserve of women and children in rural areas, adding to the already heavy transport burden on women (World Bank, 2006,; Malmberg Calvo, 1998). The provision of water in the study area is a big relief for women and children. This is because the time saved can be used productively. Evidence from the study indicates that more women on the intervention corridor were engaged in non-agriculture activities than during baseline and control periods which help to improve their standard of living.

Though potable water was available in almost all communities surveyed, the cost was higher on the control than the intervention corridors. For instance, a 20- liter container cost 20p on the control corridor but was sold at only 10p on the intervention corridor; indicating a 100% increase for the already burdened households on the control corridors. The higher incomes generated on intervention corridor were mostly allocated to consumption as depicted in Appendix 5.1.

This suggests that households view the incomes from their economic activities as sustainable which could be a challenge if the maintenance on the roads stops. The finding is at variance with what Escobal and Ponce (2002) found in rural Peru where the road beneficiaries perceived their incomes from road rehabilitation to be temporary and invested in livestock (a form of saving) for the future. It is possible that households have other sources of revenue which had not been revealed, because expenditure levels on both corridors were higher than the incomes earned by households. It is also likely that some of the goods are bought on credit which was not disclosed during the survey. Both corridors however made good use of the road to participate in economic growth which improved their welfare and the realization of the MDG on poverty and hunger. .

From the above discussions, improved infrastructure as well as efficient and affordable transport services was seen to be key in propelling the needed economic growth. This is because majority of rural poor people who were isolated, previously had access to input and output markets at reduced transport cost. Holm- Hadulla (2005) suggests that efficient transport infrastructure connects weak groups in society to aggregate economic growth through different channels. The improved access to input markets implies the ease of accumulating all the needed inputs (seedlings, tubers, cutlass, hoes, fertilizer, weedicides and non-household labour) at reduced cost. This subsequently led to increased production of the major crops produced along the intervention corridors in the study area to enhance agricultural activities, which in turn boosted farm employment. Jobs in non – agricultural activities were also enhanced as the numbers employed increased at the intervention period compared to the baseline and control corridors. According to McQuaid (2009) improved infrastructure and services are necessary for the realization of the MDGs particularly those related to employment as they enable the poor to participate in the wider economic growth. However, a further disaggregation of employment data along geographical lines by groups within the population and by income levels and into the income groups will be necessary.

Incomes in the non- agriculture sector were higher along the intervention corridor than on the control corridor. Households living along the intervention corridor had higher incomes in comparison with their control corridor counterparts. Household incomes along the intervention corridors were found to be higher than those along the control corridors. Unfortunately, households along the control corridors had higher expenditures which made them worse off to improve themselves and retard the realization of the MDG on poverty and hunger. Though income reduces poverty to an extent, access to other basic facilities is equally important for poverty reduction and achievement of the MDGs.

5.4 Impact of Road Improvement on Primary Education

Social impacts from the study were seen in education and health. The educational findings are first presented followed by health in the study areas surveyed.

With respect to education, the field data revealed higher enrolment in primary education on both corridors in relation to the other levels of education as presented in Chapter Four. However, the increase was higher (281pupils) on the intervention corridor, as those on this corridor were about five times more than those on the control corridor (62 pupils) as indicated in the preceding chapter. The high enrolment could possibly be because educational resources (information) was easily accessible to parents which enable them know the benefits of education. This will deter them from retaining their children on the farm to assist in income generation activity for the household. Other studies supporting the view that improved rural roads impact positively on school enrolment include Escobal and Ponce (2002), Khander et al. (2006) as well as Deininger and Okidi (2003). Windle and Cramb (1997) also revealed that in three of the areas in Malaysia, improved access boosted school enrolment. Bhatta (2004) in an Ethiopian study revealed that improvement in road accessibility influenced households to enrol their children in school, which led to enhanced attainment of education. Evidence from the studies as well as the present study suggests that road improvement could be a contributing factor to the increase in enrolment along the rehabilitated corridors. In addition, this study presents complementary evidence that apart from the road improvement the location of school facilities within the community offered another reason for the high enrolment as the mode used for the school journey was predominately walking at the primary level as indicated earlier in the study.

Furthering the school enrolment argument, evidence from the study revealed significant impact on girls‘ access to education at the primary level, as 23.5% were enrolled on the intervention corridor compared to 11.5% on the control corridor; with the AgonaWiamonse corridor recording a high enrolment of 28.5%. The improvement in the road is a likely reason as well as the safe environment along the intervention corridor. The presence and increase in water points for potable water supply within the community save girls‘ time to engage in productive activity such as participation in education. This evidence is consistent with findings by Levy (2004) who found in his study of four areas in Morocco that improved road access doubled primary school enrolment for boys and girls over a ten- year period. He further explained that, girls‘ participation in primary education without a paved road recorded 21% but increased to 48% with road improvement. Essakali (2005) found similar results in Pakistan where enrolment in primary education increased more on the paved road than the unpaved ones. Of particular interest was the increase for girls which showed higher enrolment, as the good access road had 41 percent compared to 27 percent on the poor access road. Thus, the impacts from the high enrolment found in the present study and that from Morocco could be attributed to the provision of schools along the good access roads or the rehabilitated roads rather than solely from the road improvement. However, the present study shows that the provision of water is another dimension to the global discourse as a major factor in the increase in girls‘ enrolment and participation.

School attendance also showed an upward trend from the baseline and control periods. For instance, school children along the intervention corridor attend school on average 5days per week compared to 3 days on the control corridor and at the baseline period; indicating a 40% increment over the baseline figure. This translates into 100 and 66 trips to school per month on the intervention and control corridors respectively. The explanation for the control corridor attendance could be related to the fact that these children are used as farm hands on household farms, to supplement the household incomes as supported by (HolmHadulla,2005). The reduction in number of days children attended school can perpetuate the poverty and hinder the attainment of the MDG on ensuring primary education completion in the district and the nation at large. Although available data indicates that Ghana is on track on achieving gross enrolment rate at the primary level, disaggregated data as presented in the present study reveal challenges at the local level because the country is struggling to achieve the target on ―Primary Completion rate‖ of 96.67% for the country (World Bank, 2014).

The presence or absence of facilities within communities was also seen to be a key determinant of school attendance. The study also revealed that communities with schools irrespective of the corridor on which it is located, as Kokosua 1 which is a control corridor had high attendance compared to intervention communities without school facilities. Conversely, Atuna a community on the intervention corridor recorded low attendance, which was probably due to the absence of the facilities within the community, children of school going age at the primary level had to walk 6.7km in almost two hours one way to school daily as already indicated in the preceding chapter.

Households also benefited from educational improvement as the presence of the road made it possible for schools on the corridor to recruit qualified teachers and the timely arrival of educational materials to facilitate effective teaching. It also reduced absenteeism and school dropout rate as indicated at the focus group discussions and confirmed by some teachers on the intervention corridor as well as from the District Directorate of Education. The study found that the number of trained teachers increased after the road improvement and teaching materials received on time which facilitated teaching. For instance, head teachers of schools in two of the communities on the intervention corridor confirmed this. The road improvement was seen to have impacted on staff recruitment as about two thirds of the teachers reside in one community and travel within 5- 10 minutes to school in a different community. This finding is supported by AU/UNECA (2005:19) study of some African countries which found the indirect effects of road improvement on access to quality resources such as teachers and teaching aids. Holm- Hadulla (2005) corroborates the view reported in the present study of reduction in absenteeism on the part of teachers and school children and the drop out rate as well as the timely arrival of teaching materials.

Not only did facilities at the basic level in the present study increase but higher order educational facilities were also attracted in the form of an SHS model school along an intervention corridor which received regular maintenance. This implies that school children from the basic level on the corridor have a higher chance of enrolling into a senior secondary school which enhances their chances of acquiring higher education to be better placed for employment to reduce the poverty level. Evidence from the study and previous studies attest to the fact that improved rural roads enhance teaching resources.

Another positive impact of the road investment was seen in the reduction of travel time to access education. On the average, it took 60 minutes to access education along the intervention corridor. Conversely, pupils on the control corridors spend 122 minutes on average to access educational facilities. Primary school children walked an average 72 minutes to cover an average distance of 4.7km and 131minutes to cover a distance of 7km on the intervention and control corridors respectively to school (one –way). Children from communities without school facilities used more time, for instance primary school children from Nsuhunu use 319miuntes on average to walk about 9km to reach their respective schools. The reason could be because of the absence or limited number of schools along the control corridors. Another reason which could be a cause for the high travel time could be the dominant mode used which was walking. This trend also affected the children‘s participation as that was the lowest with respect to primary education. Intervention in educational facilities in the less developed areas will help to address the issue of time needed to access primary education which has future benefits.

Improving accessibility to roads had an impact on school participation of children along the study corridors as this revealed a 65% and 32% of school participation in primary education along the intervention and control corridors respectively, with Poano – Ntinanko Adoowa corridor having the highest participation rate of 71% along the intervention corridor and Nsuhunu corridor recording the lowest of 15% participation in primary education along the control corridor. Due to the nature of the corridors studied, there were variations in the age at which school children participated in education. The study revealed that the age participation was generally lower for school children at all levels of schooling along the intervention than the control corridors. However, a further disaggregation of the data revealed differences, as boys along the intervention corridors started school at an earlier age than the girls. On the contrary, girls living along the control corridor rather participated at an earlier age than the boys from primary through to the SHS, with the only exception found at the KG level along the control corridor.

Reduction in participation will be detrimental for gaining the necessary knowledge to enhance the individual to gain better future employment. Attainment of education is likely to go a long way to breaking the vicious poverty cycle in rural areas to alleviate poverty and ultimately the achievement of the MDG on education in the study areas specifically and the transitional zone generally. Drop out and absenteeism of teachers and pupils as found in the present study through the focus group discussions and supported by other similar studies by Levy (2004 and EFA (2005) need to be checked to increase participation. Road improvements also facilitate supervision at the various schools along the good access roads (Holm-Hadulla, 2005). The Morocco study was not explicit on supervision as indicated in Holm – Hadulla‘s study.

Road improvement had several impacts on education such as on the attendance, access to quality resources, boost to girl‘s education and reduction in travel time. This therefore calls for government to adhere to the routine maintenance of roads before and after the rainy season to enable the road users have the full benefits of investments to improve their welfare as the households will have access to social facilities to eventually aid the achievement of the MDG on attaining universal education for all.

5.5 Impact of Road Improvement on Gender Equality

Improved roads on the study corridors resulted in travel time savings, which was put to productive use by girls and women, as most household chores are carried out by them. Girls on the intervention corridor therefore had time to be enrolled in school and attended frequently too, to improve themselves. The participation of girls in education was found to be higher along the intervention corridors, with female participation being higher along the Agona – Wiamoase corridor. The situation on the control corridor showed the reverse as already presented in the chapter. The presence of the school facilities and the safe environment as well as the information received by parents is all possible reasons for the high enrolment revealed.

This finding is consistent with findings from Holm-Hadulla‘s (2005) study which showed an increase in female participation in education at the primary level that is linked to the reduction in females burden, of which water provision has also improved and children recorded a reduction in the travel time to collect water from distant locations, as potable water points were provided on all corridors in the study area. The burden for firewood collection however, persisted in the study communities but it was most severe in the control communities as intervention communities had other options apart from firewood.

This activity in rural areas is also the preserve for women. Women on the intervention corridor took 30 minutes (one way) and searching time of about one hour as reported at the focus group discussions, making a round trip time of about two and half hours. Riverson et al. (2006) asserts that this takes up 20-25% of women‘s time in rural Africa. Thus, improvement of roads which facilitates the provision of other services has the potential to reduce women‘s transport burden and empower them to engage in productive activities as was the case on the intervention corridor as more women were found in the informal service sector. Those engaged in agriculture could also transport their produce to the market on time to trade and earn incomes to improve themselves and help the achievement of the MDG goal on gender equality. Again, improved access to health facilities, as revealed in the analysis chapter, implies that women will have better access to reproductive health information to enable them plan their families. It is important to mention that the cultural issues need to be put in perspective as some cultural practices do not allow women to even see a gynaecologist (Holm-Hadulla, 2005).

Improvement in roads enhances mobility of households to distant locations such as markets and non- agriculture employment. Road improvement reduces the burden placed on women in the study area, as the saved time was put to productive use in both agriculture and non-agriculture activities as was revealed by the present study and studies elsewhere. The present study revealed additional data on the time saved by girls which facilitated their improved enrolment in school. The social impacts cover not only education but also the health impacts of the road enhancement on the households in the study area.

5.6 Impact of Road Investment on Health Needs of Rural households

Rural communities are known to have insufficient medical care, which could be related to their socio- economic circumstances such as unemployment, low level of education and the fact that they live in poverty (Ouman and Herselman, 2008 cited in Poku –Boansi et al., 2010). They further stated that the situation places them at a disadvantage in accessing healthcare coupled with the poorly developed healthcare facilities and physical barriers, of distance and lack of public transport. In view of this, the evidence from the study is used to better understand the complexities of access to various facilities following improvement in rural roads.

The study found that, households on the intervention corridors had better access to all healthcare facilities compared to those on the control corridor. The road improvement with efficient transport services could be a reason for the increase. The operation of the NHIS could also be a factor as a greater number of households had registered as stated at the focus group discussions and confirmed from the Ghana Health Services district office. Studies which support this view include Deininger and Okidi (2003) who demonstrated with their Uganda study that the importance of improving access, is to boost healthcare of the good access communities, but cautioned that this improvement also depended on the provision of complementary services like electricity. This implies that for healthcare facilities to perform effectively and efficiently other complementary services should be provided alongside the road. Escobal and Ponce (2002) equally revealed that improvement of roads led to improved access to child healthcare centres in Peru. Windle and Cramb (1997) also found road improvement to impact positively on health care access in three rural areas in Malaysia but did not mention the importance of complementary services as indicated in the Ugandan and the present study.

This therefore implies that enhancing access to healthcare is generally important in resolving the difference in access existing between good access and poor access roads. One factor which stood out was the proximity of facilities which is also important because of the thin line between life and death as any delay could find one on either side. Working from this premise, the nearest facility (clinics) patronised was thus assessed.

5.6.1 Proximity to Healthcare

The study found that the closest facility was the most patronised. The improvement in the road seems to have had a major impact on clinics as significant visits were made by households; 10 visits were made on average within a year on the improved corridors, with control corridors accessing them 6 times on average within the same time span. The road improvement could be a reason as they facilitate easy accessibility to health services. Another factor could be the presence and increased complementary services like electricity and water supply as well as the distance to the facility. This is because the spatial distribution of healthcare facilities is poor generally in Ghana and worse in rural areas (Marcel et al., 2007 cited in Adamtey et al., 2014). This finding is consistent with Levy's (2004) study of Morocco where the road improvement increased households' visits significantly to clinics and other health facilities. This implies that where facilities are in proximity to the users the level of utilization increases. Evidence from the study and that from the Morocco study suggest that enhanced road access facilitates access to the nearest health facility.

A similar finding was presented by Adamtey et al. (2014) in a study of traditional health delivery in Northern Ghana and found that rural patients place a high premium on proximity to a facility under critical conditions as bone patients consulted bone setters within their communities rather than travelling 6km to West Mamprusi District Hospital and additional time to queue to see a doctor. Hardeman et al. (2004:27) also revealed that the distance to the hospital, the nature of roads and availability of means of transport all add up to determine the quality of access to health care.

The consensus therefore is that the nearer a health facility, the greater its utilization especially for first aid as any delay could be detrimental to the well being of the patient involved. Physical distance is only one of the factors as others factors like the ability to pay is important for the utilization of the service. It is therefore recommended that accessibility be improved to reduce the travel time to health facilities.

Porter (2002) reveals that villages without health facilities in Ghana ―*fail to reach hospital alive.*‖ and are cut from immunization programmes due to inaccessibility. Therefore inaccessibility presents a negative impact on access to healthcare due to road deterioration on rural corridors as was the case on the control corridors but the situation was worse on the Kotokesua corridor (control corridor). In view of the above discussions, location of a health facility in close proximity to households will address the health needs of households with poor accessibility and help to bridge the health gap between them and those on the good access corridors. Accessibility enhancement which ensures that the facility is within proximity of users can be applied

The known assumption that people, being rational, will use the closest facility may not always be the case as some women mentioned at the focus group discussions that the non acceptance of the NHIS at some near by clinics compel some of them to travel longer distances to the hospital to access health care Bailey and Phillips (1990), cited in Grieco et al. (2009) support this view with their Jamaican study where low- income people had to use a distant health facility because of the economic implications associated with accessing the nearest facility. This implies that the nearest facility may not always be the cheapest. It is important to note that healthcare issues are diverse and need to be viewed holistically, to benefit users accordingly.

5.6.2 Average Travel Time to Health Facility

Travel time plays a significant role in a patient‘s decision to use a facility, as a few seconds delay could be a matter of life or death. The general assumption that the closer a facility, all things being equal, it will be utilized by patients to minimize their travel time and other costs related to the choice (McCray, 2009), has been criticized by a number of researchers (Bailey and Phillips, 1990; Hoffman et al., 1997; Hays et al., 1990) since other factors such as insurance type, doctor relationships, and cultural sensitivity become apparent in the decision process.

The study found distance and time to be major challenges on poor access roads than good access roads. The distance covered by households on the intervention corridor was found to be shorter (10.4km) compared to 16.7km for households on the control corridor to access a hospital. The good access roads made it easier for households to access the hospital better than their counterparts on the poor access roads. It took on average about 30 minutes for households on the intervention corridor to cover the 10.4km to access the hospitals using motorised means, while households on the control corridors used 75 minutes to execute the 16.7km stretch by the same mode of transport. The road improvement coupled with the transport services impacted on households by reducing travel time and distance to access hospitals on the intervention corridor. This finding is consistent with earlier studies in Meru

District of Kenya where road improvement led to reduction in travel times and increased the fleet of public transport vehicles in the area, which eventually reduced cost to passengers (inconvenience, discomfort, and transport fares) (Airey, 1989; 1992). However, utilisation levels remained constant due to other social and economic factors but the present study did not cover this. This implies that both physical and economic accessibility need to be met fully to enhance access to healthcare to enhance welfare of households and ultimately lead to the achievement of the MDG on health.

The households on the control corridors were, however, compensated in terms of the cost (GH₵3) incurred on transport as they paid 0.35p lower on average, than those on the intervention corridor (GH₵3.35) to a hospital. The difference in cost could be related to the mode choice as households on the intervention corridors utilized taxis mostly which turn to charge higher than the other modes on the corridors. The finding is at variance with what earlier studies found where transport cost is usually in favour of the good access roads. Poku – Boansi et al. (2010) found that high transport cost affected women access to health facility thus increasing maternal mortality rate. This problem arises because of the means of travel which is usually through walking as motorised, and to some extent non – motorised transport, are neither reliable nor available on poor access corridors, which affects households‘ access to healthcare. This supports one finding in the present study where households on the control corridor had similar experience, when occasionally they have to support patients walk until they find a vehicle.

Though the study found motorised transport to be the predominant mode used for healthcare access, on both corridors, as 64.3 % and 74.5% used this mode on the intervention and control corridors respectively, the distances involved could be the reason for the choice. This become problematic on the control corridors as vehicles operates mostly on market days. Studies at variance with this finding include Poku- Boansi, Ekepke and Bonney (2010) who found from their study in the Gushegu District in Ghana, that bicycles were the main means of transport to access far off health facilities. To summarise, Forster (2008) asserts that access to efficient, affordable and safe transport in developing countries is scarce and affects individuals‘ timely access to health services. This implies that the transport services cannot be depended upon under emergency conditions particularly for households along the control corridors. This calls for timely intervention to save lives particularly on the control corridors. The study also found that where the distance involved is short, between 0-2km, the preferred mode is walking. The difference in mode use can also be related to the culture, terrain and affordability as seen in the northern part of Ghana where the bicycle is the mode used basically for a number of activities and motorised transport in the transitional zone where the present study is located.

5.7 Road improvement Impacts on Maternal and Child Health

Transport improvements facilitate access to health care. However, challenges besetting the nature of health services in developing countries and especially rural areas are problematic. Studies have indicated that the lack of interaction between transport and health is worrying because distance, poor condition of roads, inadequate or unavailability of motorised transport and the limited distribution of quality healthcare facilities are opportunity costs that affect healthcare access negatively (Cummins, 2002; Booycen, 2003; McCray, 2004; Stekelenburg, 2006; Dariand and Chopra, 2008). The omission of transport in the MDGs even worsens the situation, although transport facilitates access and has the ability to ensure the achievement of the MDG 4 and 5, which is ―reducing child mortality and improving maternal health‖.

Access to healthcare has the potential of assisting a mother (pregnant woman) to have all the needed information on how to deal with herself and the unborn baby to reduce likely risks. This will therefore be realised if the mother has access to prenatal and antenatal care, which can be detrimental to both parties and eventually lead to infant or maternal deaths. Johnson, Walker and Niebyl (1996: 161) argue that the prenatal care is to assist the mother sustain her wellbeing and that of the unborn child. Mothers' access to healthcare service in pregnancy is thus vital. As any delays can constrain the survival of mother and child. Kyale et al. (2005) assert that maternal deaths in connection with pregnancy and child birth can be enhanced by adopting emergency care and reduction in delays of healthcare access from antenatal to preventive activities.

Rural accessibility can be very important as it has the ability to reduce these delays to a greater extent. Views from the focus group discussions confirm delays such as those stated above were related to the death of two pregnant women along the control corridors. This happened because the situation was beyond the TBA in the community. The long distance walk of about4.5km/hour was the only option left for the community to convey the women to the nearest facility. It is possible the women were not well informed on the precautionary measures due to non- attendance of ante natal clinics on the control corridors could be the cause.

The Salvation Army Health Centre at Wiamoase on the Agona- Wiamoase corridor, however, had an organised programme for pregnant women who visit the centre. There are outreach programmes by the community health nurses to visit communities within their catchment area to provide health information on general and reproductive health, with particular emphasis on deliveries to be supervised by skilled personel. Households on intervention corridors had a greater proportion of their deliveries undertaken by skilled attendant as mentioned at the focus group discussions and confirmed by the administration of two health facilities on the intervention corridors. In contrast, those on the control corridors had limited number of births supervised by skilled attendant as indicated during the focus group discussions. DFID (2000) asserts that improvement in road quality reduces maternal mortality due to obstetric complications. Ahmed and Hossain‘s (1990) study of rural Bangledesh also affirms that improved road access is associated with better indicators of access to health services which will boost the health of women.

Conversely, households on the poor access roads are bound to have high maternal mortality as indicated at the women‘s focus group discussions along the control corridors. The cause could be the poor nature of the road which reduces speed and prolongs the travel time; thus constrain access to the needed healthcare as well as increase the risk of pregnant women and their unborn babies. Porter (2002) corroborates the view that poor access impacts negatively on healthcare. In view of this, the Salvation Army Health Centre operates an ambulance service to address emergency situations in the catchment area with particular attention to poor access areas. It must be noted that the service has been particularly helpful to households on the poor access roads, but they admitted that it is not always that patients get to the health centre alive. This could be related to the low speeds which are attributable to the nature of the control roads.

On the intervention corridor, another impact was the frequency of visits as the baseline period revealed 3 visits per year to a hospital which increased to 6 visits a year on the intervention corridor. This finding corroborates that of Levy (2004) which revealed that road improvement in Morocco doubled women's access to hospital (2.4 per year in 1995 compared to 1.1 in 1985).

From the all-female focus group discussions, it was revealed that women had benefited extensively from health improvements as health professionals come in to educate them on their health needs which include reproductive health and child healthcare. The improvement to the roads has influenced the utilization of healthcare, as the intervention corridor presented a better picture than the baseline and control corridors. Government policy on free maternal healthcare could also be a factor. This should improve treatment especially phased ones. AU/UNECA (2005) also confirm that any delay in reaching a health facility could affect immediate and phased treatment, which could be a possibility with women on the control corridor due to inadequate transport services. This could also compel them to seek service providers close by which might not be efficient (Babinard and Roberts, 2006).

Another impact area with respect to improvement to the road on health was in child health. Immunisation programmes were adhered to regularly to boost the health of children and reduce child mortality rates as confirmed by the health facilities (Salvation Army and S.D.A Health Centres) at Wiamoase.

Households on the intervention corridor had higher access to health professionals which resulted in coverage of 90 percent compared to 73 percent of households on the control corridors. Explanation for the high coverage could be attributed to the improvement of the road and government policy. The infant mortality rates in all the study districts revealed a better performance than the national figure as indicated in the analysis chapter. This could be attributed to the consumption of potable water on the study corridors. This finding was supported by Holm-Hadulla (2005) who stated that child mortality reduces with the provision of clean water and basic nutrition. The author further stated that the provision of these basic resources have the ability to reduce child mortality even if there are no health facilities. Children can also be provided with treated mosquito nets to decrease their chances of getting malaria, equally reducing their risk levels which lead to achievement of the MDG on child mortality.

Availability and reliability of transport services also facilitate children's early response to health care facilities which improves their wellbeing. Escobal and Ponce (2002) in their study of rural Peru confirm that improved road access facilitates easy access to child health centres and maternal healthcare. Children on the control corridor could experience delays to a health facility which increases their mortality rate and could lead to death. Further to this, outreach programms were equally limited along these corridors. For instance, households living along the control corridors had their children visited quarterly as compared to monthly for their counterparts along the intervention corridor, to administer immunisation and its related programes for children and women. The inaccessibility could be a reason for the lapse along the control corridor. Porter (2002) shows with her study of Ghana that immunisation programmes on the good access road were better adhered to as they were done once a month compared to once in 3 months on the poor access roads. This could be due to the inaccessibility problem as mentioned by Porter (2002). The findings on health are supported by Essakali (2005) who found that improved transport impacted positively on immunisation and more births attended to by skilled personel and this reduced deliveries at home. Though all the reviewed studies covered immunisation, the present study and Porter are in agreement concerning the immunisation but the Pakisan study did not report of the number of times the immunisation program was done on the different road types.

Another health impact was the consumption of potable water as all the surveyed communities had access to potable water. The household survey and focus group discussions revealed that conditions prevailing during the baseline situation were detrimental as communities depended on streams, rivers, and on a few occasions on potable water which increased the health risk of households. But after the road improvement both intervention and control communities now have access to potable water. The provision of water was a programme in the right direction as it curbs the rate of illness to these vulnerable children.

Households on the intervention corridor believe this was made possible because of the road improvements. Conversely, households on the control side also attributed the potable water to the retired people who had come to stay in their respective communities as well as the cocoa companies which had agents in their communities.

The Planning as well as Community Water and Sanitation officers also attributed it to government policy of ―Improving access to potable water and sanitation by 50% by 2015‖. The proportion of rural access increased by 22% between 2003 and 2008 compared to the urban access to water which was 10% (GoG, 2010). This implies that the proportion of rural people with access is substantial. This has the potential to improve health of the people which will translate into economic growth and poverty reduction eventually.

Another health impact experienced by the households living along the intervention corridor was quality of health services received by households, particularly on the Agona- Wiamoase corridor, as the location of a third of the health centres in the District were along this corridor which enhanced households access to health services. The quality of service offered improved, possibly, because more nurses, an administrator, doctors and other supporting staff, were recruited from outside the community, as mentioned by the administrator of one of the health centres. This, therefore, enhanced healthcare delivery along the road corridor and in the catchment area. Supply of medical resource also improved by almost 20%, according to the administrator of the Health Centre, because for example, immunisation programmes, maternal and child unit were under expansion at the time of the survey. This is because of the increase in the catchment area that it is presently serving (Levy, 2004; AU/UNECA, 2005 and Khandker, Bakht and Koolwal, 2006). These authors also support the view that improvement in road conditions can boost the quality of services provided.

Road improvement is seen in the above discussions as enhancing child and mother health, but the presence of healthcare in close proximity also helps to address the rate of mortality as seen on the intervention corridor. This implies that policy makers need to assess the health needs and address them to make the people healthy to boost economic growth and reduce poverty. It is also important to understand the role other socio economic factors play in the access arena to healthcare.

5.8 Impact of Road Improvement on Market Access

The road improvement had diverse impacts on market interaction by households. Evidence from the field indicates changes in marketing of farm produce since most farmers sold at farmgate and within their community. The trend changed after the improvement of the road corridor as farmers had access to weekly and urban external markets where higher and better pricing of farm produce were expected. For example, the proportion of farmers selling at the weekly market stood at 35% on the control corridor as compared to 50% on the intervention corridor. The availability and reliability of vehicles to haul their farm produce to the markets could also be an added advantage for the farmers living along the intervention corridors.

Households on good access roads were found to have better access to both input and output markets. Arethun and Bhatta (2012) support this finding with their study in Northern Ethiopia where good access roads enabled households purchase more inputs at lower prices but had higher prices for their farm produce. The consistency found in both studies implies that the improvement of roads to, a large extent, help poor rural people out of their poverty and draw them closer to achieving the MDG on employment as indicated earlier in the chapter.

Another economic impact revealed by the study was the increase in number of passengers to the markets. Households' level of interaction with outside locations increased as the transport system become more efficient. This translated into better personal mobility to markets. Though the transport services were effective the cost burden on passengers along the intervention corridor witnessed an increase for both passengers and freight as indicated by the transport operators and passengers in the study area. The international petroleum price increases could be a factor.

5.9 Impact of Road Improvement on Transport Services Supply and Usage in the Study Area

The road improvement and subsequent maintenance was found to impact more on households living along the intervention corridor than those on the control corridor. For example, two of the intervention corridors, Agona- Wiamoase and Old – Drobo – Ponko No. 1 had bitumen surfaces. This translated into increased volume of traffic along these corridors, as the Agona – Wiamoase recorded an increase of 60% in traffic volume during at the survey period. The road improvement coupled with regular routine maintenance as indicated by the Feeder Roads Officers in both districts could be partly responsible for the increase. This improvement therefore led to an all - weather usage of the corridors by the households living along it which had positive growth effects in their engagement in diverse economic activities and the boost in incomes which made it possible for high consumption of goods and services as indicated in the analysis chapter.

Households along the intervention corridors benefitted from the road improvement in several ways. Evidence from the field indicated that transport service available and utilized at the baseline period were in poor state and limited (pickups, small rickety trucks and rickety taxis). Not only was the inadequacy a challenge, the trucks came only on market days and one taxi running throughout the day. The only exception was the Agona – Wiamoase corridor which had a number of vehicles before the improvement. However, the situation changed after the rehabilitation as the corridor saw a variety and improved services from motorised (large and small trucks, taxis), non – motorised (bicycles, push carts) vehicles. The increase in services resulted in frequent service delivery, where taxis particularly, had several round trips within a day. The finding is in consonance with Levy‘s (2004) study which revealed that in rural Morocco households experienced an increase in shared taxis usage after the road investment as well as the frequency used within an hour. Motorised transport increased generally in the study area, but was significant along the Old – Drobo – Ponko No. 1 corridor which also led to long distance travel along the corridor as on average motorised kilometres travelled was 24km as shown in Chapter Four. The evidence is consistent with findings from Bryceson, Bradbury and Bradbury (2006) in their study of Vietnam and Zambia where the road improvements encouraged long distance travel, thus enhancing households‘ mobility. On the contrary, in Ethiopia, where the improved road brought in a market, reduced the need to travel by the households, thus enhancing their accessibility. The present study did not capture any non- motorised transport means along the Old Drobo – Ponko No. 1 corridor but this was mentioned by authors in the Zambia and Vietnam study though limited in Zambia. The limitation in the African region could be the lack of awareness or the non affordability issues surrounding its ownership. The Ethiopian experience was consistent with findings along the Agona – Wiamoase corridor. This implies that where facilities are in proximity, they reduce households need to travel.

The increase in traffic volumes could be connected to the improved road as this was not the case on the control corridors. Transport operators gain the most as this provides direct employment for them. Households on the corridors also enjoyed transport cost reduction and had options to choose from to satisfy their personal mobility needs. Cost of transporting freight along the improved corridor was also cheaper as the cost of transporting a 50kg of cassava per km was 0.20p than along the poor access road which was three times that of the improved corridor. The role played by non- motorised is vital as it fills the gap between motorised transport and walking as confirmed by Starkey et al. (2002). The authors however warned that, though cheaper than motorised transport their availability and affordability present challenges particularly in the rainy season when the service is most needed. The design does not help women who have a huge transport burden but low incomes to patronise motorised ones. Surprisingly, the intervention corridor was found to have more of the non – motorised transport, with Agona – Wiamoase corridor recording the highest among the intervention corridors as shown in the analysis chapter. This could be attributed to the improvement in the corridor, which led to enhanced economic activities and ultimately boosting incomes earned which made it possible for the households to own bicycles, as this was the only ones captured in the study area. Another possible factor could be the location of facilities and services in proximity to the households which might have reduced the need to travel long distances along the corridor as indicated earlier in this study. The study‵s finding is at variance with DFID (2003) which revealed that non- motorised transport is mostly found along poor roads as they operate better along such roads.

Walking was found to be the dominate mode of transport for most internal and short distance trips. Households using this mode to undertake their activities numbered 401, which was about half the population sampled along the intervention corridors with only 13 doing so on the control corridors. Agona – Wiamoase corridor‵s highest record of the number of households using this mode to execute their activities along the intervention corridor, could be because of the location of facilities within the community which required walking as distances were between 0-5km on the average. Generally, distances walked were shorter along the intervention than the control corridors. The control figure was rather unusual as this is the main mode usually used in off-road locations to access diverse activities (from water collection to grilling mill). It is possible that there was under- reporting of the activities executed through walking. The reason could be attributed to the high tariffs which were unaffordable to the majority, particularly women who shoulder much of the household transport burden but have inadequate incomes. It could also be that the activity locations could be accessed through walking. This finding is supported by Porter (2002) who confirmed that rural people inhabit a _walking world‵.
This implies that most activities are undertaken through walking in rural areas.

Reduction in travel times to almost all socio –economic facilities came as a cost to them, as transport expenditure showed a marked increase. This phenomenon could be attributed to the change in travel patterns of the households as they were exposed to the outside world which increased their level of interaction. For example, informal service activities were higher on the intervention corridor than the control and baseline situations as noted in

Chapter Four. Similar studies which support this finding include Porter (1997) who found that people's mobility increases if they can get the required modal choice to connect them from one location to another to access economic potentials. This implies that the medium for the movement is paramount to achieving personal mobility and economic growth. This enables the individuals to reduce their poverty and ultimately help with the achievement of the MDG 1-6.

Another impact was the reduction of expenditure on vehicle operations, as the improved road condition not only reduced travel time. It also reduced the frequency of maintenance on average from 3 times for taxis per month before the improvement, to once on average after the improvement as indicated by the vehicle operators. Indicating about 60% reduction in the cost of maintenance, which can be saved to improve services on the vehicle or increase their consumption of services to enhance their welfare.

Table 5.1: Impact of Road Investment on the Achievement of the Millennium Development Goals in the study area.

MDG Indicators	Impact on the Study Communities
Extreme Poverty and Hunger	• Improve roads to input and output markets • Lower transport cost to inputs/output markets • Reduced price of inputs • Increase production • Reduction in the operations of middlemen **Non Agricultural Production** • Increase access to non-agriculture employment • Increase incomes from agriculture and non-agriculture • Increase consumption of goods and services
Achieve Universal Primary Education	• High school enrolment • High attendance • Improve attendance for girls than boys • Age participation rate was lower on improved roads. • Reduced drop out rate on intervention corridor • Improve resource (teacher, teaching aids)

Promote Gender Equality and Empower Women	• Improved transport infrastructure and services help women to have time for other activities • Women's engagement in agriculture and nonagricultural activities • More women in non-agricultural activities along the intervention corridor • Improved road and transport services increase the access to markets (agriculture) • The provision of water points within the community enabled girls save time to access schooling, as more girls were in school along intervention corridor.
Reduce Child Mortality and Improve Maternal Health	• Improved access to health facility • Availability to health facility • Travel time reduction along intervention corridor • Use of NHIS • 90% access to healthcare on intervention corridors • 60% access to healthcare on control corridors • Emergency obstetric care seeking could be a problem on control • Consumption of potable water

Con"t Table 5.1:Impact of Road Investment on the Achievement of the Millennium Development Goals in the study area.

MDG Indicators	Impact on the Study Communities
Millennium Development Goals (MDGs) 6	• Immunization was once a month along the intervention and once in 3 months along control corridor. • Phased treatments are challenged along the control but adhere to along the intervention • Available modes to health care (intervention) • Walking is usually the most available along control corridor, which may cause delays under emergency health condition.
	• Use of taxi, trucks etc (motorized) • Non-motorised modes dominant along intervention bicycles • Walking was predominant mode on both corridors

	• Rural community are connected to markets and other opportunities outside their community or corridors with improved road • Households are able to interact with family and friends and other local connections • Both men and women are empowered as they can move about freely to locations of interest.

Source: Compiled by author, 2014

The section following explains how the various objectives set out by the study were achieved.

5.10 Linkage of Study Findings to Objectives

This section demonstrates how the various research objectives were achieved together with their major findings which will serve as basis for evidence based policy.

Objective One

An assessment of the impact of feeder road improvement on the economic activities of households living along the study corridors.

Research Question One

How has the feeder road investment affected extreme poverty and hunger of households along the study corridors?

Review of literature showed that, the variables that influence poverty and hunger are the economic activities together with household incomes and consumption. Economic activities engaging rural people include farming, non-agricultural service and industrial work. For agricultural employment, literature indicates that improved roads influence access to inputs markets, reduction in price of inputs, increase usage by farmers, productivity level increases, increased production increase to boost agricultural activities.

However, from the data analysis it was found that improved access led to transport cost reduction to access inputs markets where prices for the inputs were lower. The reduction in input prices meant farmers along the intervention corridor could purchase and use more inputs. The study also revealed the timely arrival of inputs as speeds to the markets had increased. Households on the control corridor used limited inputs and bore a greater burden in terms of cost than their counterparts. The study also showed marked difference in the quantity of inputs used along both corridors, particularly fertilizer and non- household labour along the intervention corridor. The improvement of the roads presents an explanation as well as the location of input shops along the intervention corridor for the high input usage. Households;‘ access to output markets also had a positive impact on increased production for farmers which in turn increased their profit margins and led to increased incomes. The road improvements and the large quantities of farm produce cultivated by farmers as well as the ready market and better prices received at the external markets compelled farmers to increase their production along the intervention corridor.

Studies which also report on non – agricultural employment attributed it partly to the road improvement, which enabled households to move to locations outside to engage in these activities. However, the present study found that the improvement of rural roads brought about these types of employment along the corridors which allowed household members to participate in them. Further to this, the incomes from these activities were found to be higher than incomes from agricultural employment along the intervention corridors. More women were engaged in these activities along the intervention corridor.

The household income was another variable which was found to reduce poverty and hunger from studies reviewed. Literature reveals that income sources differed, whereas some studies were in favour of road improvements to be selected to boost agricultural activities others were for the selection of such roads to boost non- agricultural activities. This study, however, found that incomes in non- agricultural activities were higher along the intervention corridor while those along the control corridor had higher incomes from agricultural employment. The income from these activities forms a greater part of household incomes which are used on their needs. However, it was found that, agriculture and informal service activities were the main economic activities utilized by households on the study corridors. An assessment of households‘ incomes found that the intervention corridor had higher incomes which could be explained by the diversity in employment opportunities on the corridor from the road improvement.

The study also showed that the incomes were spent on the household needs such as water, food, education, health and transport which collectively have the ability to reduce households poverty and hunger along the improved corridors‘. This results in welfare improvement and finally to the achievement of the MDG on employment and hunger.

Objective Two

An examination of the impact of the feeder roads improvement on accessibility to basic life-sustaining services (health and education).

Research Question – Two

What is the relationship between feeder road investment and accessibility to basic –life sustaining services including; health, education, markets and infrastructural facilities.

The review of relevant literature indicated that, the factors which influenced accessibility to basic facilities are travel time, distance, mode of travel and cost of travel. However, the study revealed that distance, travel time and location of educational facilities were the factors that impacted on educational enrolment and attendance along the study corridors.

The analysis, indicated that the location of a school was a major determining factor on enrolment and attendance. This is because the intervention corridor had 281 pupils in school whereas the control corridor had only 62 pupils. This was supported by the numerous schools located on the intervention corridor with very few along the control communities. The trend was expected on the intervention corridor as road improvements open up locations which increase the number of people living there and the fact that other complementary services may also come in to enhance the standard of living of households. Though the other studies relate the increased enrolment and attendance to the road improvements and complementary services like electricity; this study further revealed that the location of schools within a community was a major contributing factor.

The mode of travel used to undertake the school trip was found to be walking irrespective of the corridor. The burden on the children on the control corridor was higher, as more time is used to travel to school. The opposite was true for children along the intervention corridor.

From the forgoing, it can be inferred that improved roads have had a positive impact on school children‘s access to education, which has long term economic value and encourage completion of primary education as well as reduction in absenteeism and drop-out rates to improve their welfare and achievement of the MDG on education.

Transport cost, travel time, distances and mode of travel were factors which influenced households‘ access to a health facility. This study has found that, travel time and distance which translate to travel speed to a facility, mode used and proximity of facilities were factors that influenced a patron‘s choice and utilization of healthcare. Further, this research revealed that, travel time and distance were the most significant factors considered by a patient or household in their decision to use a particular healthcare facility in the study areas. The speed at which a patient travels to access healthcare was critical as any delay could be a matter of life or death. The availability and affordability of transport services along the intervention corridors facilitated the ease of accessing healthcare compared to travel along the control corridors. Easy access also facilitated children and pregnant women‘s access to health care on the intervention corridors, which enabled them have the needed care required to keep them safe and healthy. Thus, reducing infant and maternal mortality rates and the achievement of the MDG on health.

Access to market was also found to have improved after the intervention. This was seen in farmers increased access to modern inputs and extension services to boost production. This will in turn lead to higher production as good access to output markets is made possible, where higher prices are offered, thus increasing the profit margins which lead to increased incomes of the households. The market also enables households to integrate into the wider society as selling on the markets connect them to others. The higher prices for goods on the market will boost the incomes of households to improve their welfare and the achievement of MDG on poverty and hunger.

Improved access to primary education, healthcare and market services as well as the consumption of minimum quantities of these services will also improve the welfare of households on the intervention corridor. These changes were all considered critical in the achievement of the MDGs on health and education.

Objective Three

An assessment of the factors inhibiting the utilization of the improved road corridors.

Research Question Three

What are the factors inhibiting the utilization of the improved road corridor?

Other studies indicate that the factors that hinder the utilization of improved roads are the extent and frequency of maintenance of the road as well as the reliability, affordability and frequency of transport services.

The study revealed that, factors affecting the full utilization of the rehabilitated roads were the non-maintenance of the road, and the inefficient transport services operation along both the intervention and control corridors. Non-maintenance or neglected maintenance was the foremost factor which affected road utilization on the study corridors. For instance, the neglected maintenance on the Awisa –Atuna corridor could be an explanation for the diminished benefits revealed along the corridor as the ADT volume nine years after the rehabilitation showed a reduction of about 133%.

However, corridors which saw regular maintenance such as the Agona-Wiamoase and Old – Drobo corridors provided households with higher and better benefits as existing complementary services along the corridor improved or were upgraded, while new ones were added. For example, the Agona- Wiamoase corridor attracted two model Senior High Schools. This could be attributed to the corridors improvement coupled with the complementary services such as electricity and water enjoyed by the households on the corridor.

Transport services were found to be adequate, reliable, available and affordable. Households or passengers not only had access to a variety of transport services including motorized and non –motorized services but had better services compared to the worn out and old vehicles used at the baseline and on the control corridors. The reason being that the nature of the road encouraged newer and better services as the vehicle operating cost was reduced following the surfacing of the road. This implies that most drivers would prefer to operate on the improved corridor and avoid the control section where the road condition is poor and demand is depressed.

Surprisingly, the number of non-motorised transport vehicles found on the intervention corridor was higher than on the control corridor. This is contrary to expectation because it is reasonable to expect that the control roads would rather have more of these services as the road condition serve them better as asserted by DFID (2003) and explained earlier in the work. Bicycles were the main transport mode found in the study area and used primarily, for the haulage of goods from the farmgate to the home. Though the road improvement enhanced the supply situation, walking was still the dominant mode used to access a number of activities on the intervention corridor which could be the result of the high tariffs on that corridor. This could have arisen either because of the increase in fuel prices or close location of facilities within the communities.

The evidence from the field and literature reviewed suggest that road investments have diverse impacts. This study further noted that where maintenance of improved corridors was neglected households suffered as complementary services are usually absent. It is therefore essential for improved rural roads to have regular maintenance and provision of transport services to enable households living along the corridors benefit fully to enhance their socio-economic well-being and ultimately help in the achievement of the MDGs.

The forgoing clearly indicates how data from the field were used to answer the questions posed by the study. The following section addresses the way forward on how to sustain road investments in the study area.

5.11 Summary

Rural roads investments as seen in the discussion in this chapter present both economic and social impacts. The study revealed both positive and negative results, though the negative impacts were insignificant (see Table 5.1). On the economic impacts, improved roads led to increase in input supply and use, improved access to extension services, increase in production levels of major crops, increase in non- agriculture employment, as well as increase in incomes from agriculture and non-agricultural work. Incomes earned were spent on essential items to improve the welfare of households on both corridors.

On the social side, the improved road led to increased enrolment in primary schools, reduction in travel time to school and quality resources arriving in time to aid teaching and learning. The health impacts were improvements in access to healthcare services, reduction in travel time and increase in frequency to health services. More households were able to send their goods to weekly markets and urban markets to have competitive prices for them to earn them more incomes. Transport services witnessed improvements in the fleet and number of times in operations. Transport operators enjoyed reduction in the cost of maintaining their vehicles. It was noted that regular improvement is required to make the investment sustainable.

In the final chapter of this study, recommendations are made to help improve the circumstances of rural dwellers in the study area as they strive to achieve the MDGs following road investments. This study‘s contributions to knowledge as well as areas for further research are some of the areas treated in the next chapter of this study.

CHAPTER SIX

RECOMMENDATIONS AND CONCLUSION

6.0 Introduction

The research set out to assess the impact of transport investments on the achievement of the Millennium Development Goal (MDGs) 1- 6, in the transitional zone of Ghana and evolve appropriate policy recommendations to improve future transport investments on the socio-economic lives of rural people. The research was carried out at a time when the MDGs are drawing to a close and new ways are needed to sustain the gains made over the 15- year period and to look for sustainable ways of impacting lives to end poverty to the extent possible.

A major challenge to the achievement of MDGs 1-6 is related to the non-inclusion of transport in the goals generally and the targets specifically. It has however been realized over the period that transport is key to accessing almost all the MDGs. This is because transport has the ability to break the isolation most rural people experience. Studies have shown that about 70% of the MDGs targets are also located in rural areas, as transport is seen to lessen the rural burden of women and children. Transport plays a significant role in linking remote communities to economic and social potential to improve themselves and help in the MDGs achievement.

The earlier chapters have presented the overview of the study, discussed the relevant literature, the methodology, and field data analysis as well as presented the discussion of the major findings. These chapters include the discussion of major impact areas and their implications on the MDGs attainment in the study area. The present chapter, which is also the final chapter of the study, is divided into three sections; with the first dealing with the study recommendations which emanated from the study findings and seek to provide the needed direction relevant to sustain the impacts derived from road investments over the long period. The study's contribution to knowledge is presented in the second section and finally, issues with implication on public policy as well as the gaps in knowledge which may require research in the future are outlined.

6.1 Study Recommendations

Based on the findings, recommendations have been presented to enhance the socio – economic lives of rural people in the study area. These recommendations were formulated in relation to the sustenance of rural road investments to better serve the households living along the roads studied, the transport operators and the larger community. The emphasis is placed on the impacts presented by road investment as well as policy implications. Policies have been suggested with the aim of ensuring sustainable road maintenance in the study area to address the poverty and enable them improve their standard of living. These policies have been grouped into short term, medium term and long term. Short term ones are those that can be addressed within the first two years, while the medium term options are expected to be implemented between two to five years, with the long term ones being beyond five years as they require substantial resources for their implementation compared to the short and medium term ones.

6.1.1 Policy Areas

In view of the foregoing, the following policy options are presented for in depth assessment, to provide guidelines to ensure sustainability of rural road investment provision.

Short Term Policies

i) **Encourage participation of communities in the maintenance of rural roads**
Communities can be resourced to take up basic routine maintenance activities such as grass cutting, desilting culverts and spot improvements as an initial measure to enhance access to basic services. The assembly person can organize

the community members to do this, this is because the communities are already committed as they have being doing some maintenance on their own whenever the need arises. The next step is for the community to wait for organized routine maintenance from the Department of Feeder Roads from the District/ Municipal Assembly.

ii) The re-introduction of the one- man contractors in the maintenance of feeder roads in the district to maintain well defined sections of these roads.This approach is best situated for small scale maintenance works which best fit the

ones on rural corridors. They also employ the local people which generate income for them to get them out of poverty.

iii) **Strengthen and encourage the operations of non- motorized transport**. This action will be credible as the road surface along the control corridors are best suited for the services of NMT. For instance, DFID (2003) has argued that bicycles perform better on earth roads, than paved and gravel roads and impose lower cost of maintenance to connect the poor rural people to markets, health and educational facilities. This will increase the number of rural dwellers with access to these facilities to improve themselves and other household members. Again, the three wheelers used which do not have a roof can be improved to have a roof as used in rural Myanmar to carry both passengers and freight and not only freight on the corridors as presently done. The District Assemblies can subsidize the operators to acquire and pay- up on installment until the cost is fully paid, initiated by government and some assemblies have started its operation in the country.

iv) **Need for the relevant institutions to conduct follow up after an investment.** It is important that after an intervention on roads have been implemented their impacts are assessed against the objective for the investment to ascertain whether the provision has achieved its intended objective. There should be quarterly review of the condition of the intervention roads by the District Feeder Roads Engineer or a team from the Monitoring and Evaluation section of the District Assembly to assess the state of the roads in their catchment area.

v) **Expansion and intensification of outreach programmes**

The District Health Services Management Team in collaboration with District Assembly should assist the health facilities within the catchment areas to embark on this activity, as this will impact on women and children in remote areas to boost their health status. It will also help to make them productive to execute other activities within the household. Infant, child and maternal mortality rates will be brought under control.

vi) **Intensification of monitoring and evaluation on child and maternal health**. It is important that the Ghana Health Services at the districts step up their monitoring and evaluation of maternal and child health issues. This will help to address problems which will deter the achievement of the goals so as to reduce the mortality figures by putting in the needed measures like the provision of mosquito nets and other relevant information to women to help them and their children.

vii) **Improving and expansion of emergency transport services**. The District Assembly can support the health facilities within their catchment area without vehicles and fuel to be used for emergencies in all communities with special attention on the remote ones. This can help reduce child and maternal emergencies which could lead to death.

Medium Term Policies

i) Decentralizing maintenance at the local level.

This requires the Head Office of the Department of Feeder Roads devolving the responsibility for maintenance to District/ Municipal Assemblies. This implies that the District Assemblies are given the ownership and responsibility mandate in relation to maintenance of the roads within their districts to improve supervision and monitoring of contract works for better output. The Department of Feeder Roads, however, needs to maintain its coordination to keep track of all the roads, their connectivity and ensure that standards are strictly adhered to. ii) Alternative funding arrangements for feeder roads maintenance. Inadequate funds for road maintenance is a major challenge in the country. Presently the resources from the Road Fund allocated for maintenance are not enough so there is the need for the share to feeder roads to be increased. It is also important for other sources (corporate institutions, farmer groups) to be explored for more funds for maintenance. It is therefore suggested that the Cote d'Ivoire model could be adopted. This model which involves the establishment of a fund for general rural development (roads, water, sanitation, etc) levies are charged as well as securing compulsory contribution from agri-business and those engaged in extractive natural resources who are likely to damage the road with their activity. An executive board manages the fund with contributors having representation on the board.

The funds are applied to the services mentioned earlier to bring about total development to rural area.

Long Term Policies

i) Creation of a local hub within particular catchment areas where facilities and services like education, health and markets will be located and have them connected by footpaths and tracks within a radius of 10km from the surrounding villages to the centre to access the other services relevant for the welfare improvement of the local people. ii) The District Assemblies should widen and improve the condition of roads to the control corridors which will attract transport services to improve the mobility of the households along those corridors.

The study's contribution to the broad knowledge base on rural transport is next presented to join in the global discussion.

6.1.2 Contribution of Study to Knowledge

The prime reason for undertaking this research was to contribute to the knowledge on rural transport impacts and the achievement of the MDGs. The results of this study have provided useful findings and recommendations for rural roads investment and welfare realization. Based on the analysis and discussions, it was realized that the study has made contributions to knowledge and theory. In terms of the broad knowledge on rural road impacts the study made the following specific contributions:

i) The study revealed that, following the improvement to the roads, girl - child enrolment and attendance increased significantly, as travel time to educational facilities reduced, particularly, for primary education. Not only did the girl child enroll in school but their numbers outstripped the boys along the improved corridor. The reason could be the safe environment enjoyed by children to walk to school. The presence of schools in the communities as well as supervision which was also made possible because of the road improvement. Government policy on girl – child was operational in the district and could be a possible reason for the increase but the road improvement opened up the community which enabled better monitoring and supervision from the District Directorate of Education as well as lessened the burden from fetching water from distant sources with the provision of potable water within the community. ii) Improved roads resulted in enhanced access to healthcare generally and to clinics in particular. It also resulted in travel time reductions but contrary to expectation the study found higher costs of motorised transport to hospitals along the improved corridor which is at variance with what other studies have reported elsewhere. This has the ability to deter the use of the facility and it also implies that the provision of roads is not a precondition for usage of facilities and services. Instead, physical and economic access are important for utilization of services to achieve the MDGs

iii) The study also revealed that enhanced roads increased the volume of traffic and increased operations of both motorized and non- motorized transport services. The distinctive part of this finding was the increased use of non- motorized transport along the intervention corridor beyond the levels reported along the control corridor. This finding is at variance with what DFID (2003) found which showed that, instead unimproved roads rather have more non –motorised forms of transport given that the condition of the unimproved roads better serve them. This study has revealed that with high transport tariffs along improved corridors, walking and non –motorized transport forms fill the gap.

In shaping the ontology of transport impacts in rural communities in the global south, the study also presented some contributions including the following:

iv) The study has revealed important issues to broaden our understanding of rural transport. Earlier studies have established most ‗intended impacts' of rural road investment as captured in the literature, but the present study has revealed ―unintended and personal impacts of rural road investments‖.

a) Personal and embodied – The study found that impacts of roads are seen from a personal and everyday life perspective by many of the respondents. Thus, they used their own everyday life to measure the impact of the road investment on their life.This is a point of departure from what is usually discussed in the literature on rural transport.

b) Aged and Gendered Impacts- There also appear to be a connection between age and gender and how rural transport investments impacts are measured and felt in rural communities.

c) Differential- While impacts are usually to be collectively felt. There appear to be significant differences between communities along the same corridor and between households within the same communities.

The following section presents the areas for further research to better understand the proposed issues in the rural transport knowledge base and how they could impact on socio economic lives of rural people in the study areas.

6.1.3 Questions and Areas for Further Research

The review of previous studies on rural transport impact on the welfare of rural people and the achievement of the MDGs and this study have unveiled some issues to be further researched. These are presented below:

i) *How does road improvement affect extension services operations?*

The expectation from the study was that the improvement of the corridor would enhance access to inputs or the factors of production as seen along the intervention corridor, but unfortunately this did not manifest in a huge increase in production, even though extension service activities were evident as farmers along the intervention corridors received twice the visits pertaining along the control corridor. The problem, however, could be the limited number of extension officers at post as indicated by the Agriculture Officers.

ii) *What are the variations in impacts from maintaining a poorly deteriorated road from a slightly deteriorated one.*

The magnitude of the impacts were different but. This may be related to the difference in the state of the roads before their rehabilitation, which subsequently affect the magnitude of impacts from the roads.

iii) *Does improved road influence the quality and magnitude of service accessed by rural people?*

The present study has established that improvement in rural roads has the ability to improve access to facilities. What is not known is whether the access improvement translates into improved service level likely to be enjoyed by the users. This is because having physical access does not imply service can be accessed economically to have minimum quantities consumed. An in depth research is therefore suggested to better understand the issue.

iv) *How much of women and children"s time is saved with improvement in rural roads?*

Improvement in rural roads enabled children to have time to attend school. Women are also afforded time to engage in economic activities to improve themselves and their families. What is not clear is how much time is actually saved to be utilized in these productive activities.

These issues are relevant and suggested for future research to better understand the opportunity cost of women and children‘s time in rural transport planning as well as sustainable development.

6.2 Conclusion to the Study

The objective of the study was to assess the impacts of road improvement on the achievement of the MDGs and make recommendations to guide policy makers to sustain the revealed impacts to eradicate poverty and eventually achieve sustainable development.

The incidence areas that the road impacted were identified in the preceding chapter. The direct impacts were, in the reduction in travel time, cost and mode of transport used, while the indirect ones were the access improvements to economic and social services. Additionally, recommendations have been presented to sustain the impacts over the longer term as well as the extension of such improvements on to the control corridors surveyed to improve the lives of households living along those corridors.

The study revealed that the access components of rural transport has been tackled well, with regard to the improvement to the corridors surveyed as this enhanced households access to their socio-economic needs. However, the mobility components still persist as these services are mainly provided by the private sector who are profit oriented. Government may have to provide an enabling environment to enhance their operations to fully benefit the households living in the road catchment area. This is because improved access without improved mobility still keep rural people in isolation.

Central to this study is the impact improved roads and continuous maintenance have had on two corridors. The study has come out with key findings which will contribute immensely to the rural road transport in the selected communities. Areas from the study which are unclear present gaps in the knowledge and thus have been proposed for further research.

In concluding, it must be emphasized that, rural transport improvements affect a number of people who are isolated in rural areas, so efforts must be made to review and continuously improve the roads leading to these areas to enhance their socio- economic lives and ultimately the achievement of the MDGs and sustenance of the revealed impacts.

LIST OF REFERENCES

Adamtey, R., Oduro, C.Y. and Ocloo, K. A. (2014). The Importance of Traditional Healers in the Planning of Rural Healthcare Delivery in Ghana: The case of bonesetters services in Loagri and Wungu. *Journal of Science and Technology* 34(3): 55-67.

Adarkwa, K.K. (ed) (2014). *Human Settlements and Service Delivery in Ghana*. Kumasi. University Printing Press (UPK).

Adger, W. N., Benjaminsen, T.A., Brown, K. and Svarstad, H. (2001). Advancing a Political Ecology of Global Environmental Discourse. *Development and Change* 32, 4: 681-715

Africa Union (AU) and United Nations Economic Commission for Africa (UNECA), (2005).*Transport and the Millennium Development Goals in Africa.* Addis Ababa, Ethiopia: African Union.

African Union (2008). *First Session of the Conference of African Ministers of Transport* 21 – 25th April, 2008 Algiers, People's Democratic Republic of Algeria.

Ahmed, R. and Hossain, M. (1990). *Development Impact of Rural Infrastructure in Bangladesh.* IFPRI Research Report No. 83, International Food Policy Research Institute (IFPRI), Washington D.C.

Airey, T. (1992). The Impact of Road Construction on the Spatial Characteristics of Hospital Utilization in the Meru District of Kenya. *Social Science Med,* 34(10): 1135-1146

AMDD (2010). The Role of Road Infrastructure in Improving Rural Health Situations. *Bridging the Gaps: Through Designing and Constructing Socially Responsive Road Infrastructure*

Ameratunga, S., Hijar, M. and Norton, R. (2006). Road-traffic Injuries: Confronting disparities to address a global-health problem. *Lancet* 367, 9521:1533-1540

Appiah, K.O.A. (2000). *Poverty Reduction in Ghana and Options for the Preparation of an Agenda and Strategy* (Paper Prepared for the Technical Committee on Poverty, NDPC, 2000) pp. 1-3

Arethun, T. and Bhatta, P. B. (2012). Contribution of Rural Roads to Access to and Participation in Markets: Theory and Results from Northern Ethiopia, *Journal of Transportation Technologies*, 2, 2: 165-174.

Aryeetey, E., Harrigan, J. and Nissanke, M. (Eds) (2000). *Economic reforms in Ghana: The miracle and the mirage*. James Currey/Woeli Publishing, Oxford, UK

Asian Development Bank (2011). *Empowering Nations through Regional Cooperation; Economic Cooperation Initiatives, Sub regional Programs,* accessed from http://www.adb.org/documents /reports/regional cooperation/ theme400.asp, date accessed 14/03/2011.

Baah-Boateng, W. (2004). Employment Policies and Sustainable Development: the Experience of Ghana, (mimeo.), Department of Economics, University of Ghana, presented at a National Workshop on an Employment Framework for Ghana‘s Poverty Reduction Strategy, Government of Ghana/UNDP/ILO, May 7, 2004, Accra. Accessed 24/01/2010.

Babbie, E. (2009). Basic of Social Research. Accessed on 15th July 2011 at http;//www.scrbd.com/doc/32594161/The-Basics-of-Social-Research-5th-EdEarlBabbie-Texbook

Babbie, E. (2009). *The Practice of Social Research,* Twelfth Edition, Wadsworth, USA, Cengage Learning.

Babinard, J. and Roberts, P. (2006). Maternal Health and Child Mortality Goals: What can the Transport sector do? *Transport Paper TP-12. The World Bank, Washington, DC*.

Bailey, W. and Phillips, D. R. (1990). Spatial Patterns of Use of Health Services in the Kingston Metropolitan Area, Jamaica. *Social Science & Medicine*, *30*(1), 1 12.

Barcellos, C., Feitosa, P., Damacena, G.N. and Andreazzi, M.A. (2010). Highways and outposts: economic development and health threats in the central Brazilian Amazon region *International Journal of Health Geographics* 9:30: 1-10

Barratt, H. and Kirwan, M. (2009). *Cross-Sectional Studies; Design, Application, Strengths & Weaknesses of Cross-Sectional Studies*, accessed from http://www. healthknowledge.org.uk/public-health-textbook/research-methods/1aepidemiology/cs-as-is/cross-sectional-studies, date accessed 07/04/2011.

Barrett, C. B. (2001). Does Food Aid Stabilize Food Availability? *Economic Development and Cultural Change*, 49(2): 335-349

Barwell, I. and Malmberg-Calvo, C. (1989). *The Transport Demands of Rural Households: Findings from Village-Level Travel Surveys*. Makete International Rural Transport Project. Geneva, Switzerland. International Labour Organisation.

Barwell, I. (1993). *Final Synthesis of Findings and Conclusions from Village Travel and Transport Surveys and Related Case Studies. Local Level Rural Transport in SubSaharan Africa.* Geneva, Switzerland. The World Bank/ILO

Barwell, I., Edmonds, Howe, J.D. and Van de Veen, (1985). *Rural Transport in Developing Countries*, Geneva, Switzerland. ILO

Beenhakker, H.L., Carapetis, S., Crowther, L., and Hertel, S. (1987). *Rural transport services: a guide to their planning and implementation*. London, Intermediate Technology Publications.

Bekwai Municipal Assembly (2013) Municipal *Medium Term Development Plan.* Bekwai Municipal, Bekwai

Bhalla, G. G. (2000). Evaluation of Infrastructural interventions for Rural Poverty Alleviation. Bangkok, UNESCAP.

Bhatta, B. P. (2004). Socioeconomic Transformations and Road Accessibility: Evidence from Northern Ethiopia. A Thesis Submitted in Partial Fulfilment of the Degree of Master Science in Development and Resource Economics at the Department of Economics and Resource Management Norwegian University of Life Sciences. Accessed on 10th February, 2012 at http://www.ub.uib.no /elpub/Norad/ 2004/nlh/ thesis01.pdf

Binswanger, H.P., Khandker, S. R. and Rosenweig M.R. (1993). How infrastructure and financial institutions affect agriculture output and investment in India. *Journal of Development Economics*, 41: 337-366

Blocka, S. and Webb, P. (2001). The Dynamics of Livelihood Diversification in PostFamine Ethiopia. *Food Policy*, 26: 333-350

Booysen, F. (2003). Urban–rural inequalities in health care delivery in South Africa. *Development Southern Africa*, *20*(5), 659-673.

Braunholtz, T. (2007). Gordon Brown and the MDGs at midpoint. ODI Blog. Accessed 20th September, 2014 at http://blogs.odi.org.uk/blogs/main/ archive/2007/ 08/08/ 3854.aspx.

Bryan, J, Hill, S., Mundaf, M. and Roberts, A. (1997). Road infrastructure and economic development in the periphery: the case of A55 improvements in North Wales. *Journal of Transport Geography* 5, 4: 227-237.

Bryceson D. F., Bradbury A., Bradbury T. (2006) Roads to poverty reduction? Dissecting rural roads‘ impact on mobility in Africa and Asia. *Development Policy Review* 26: 1–38

Bryceson, D.F., Bradbury, A. and Bradbury, T. (2008). Roads to Poverty Reduction Exploring Rural Roads‘ Impact on Mobility in Africa and Asia. *Development Policy Review* 26:459–482.

Central Bureau of Statistics (2004). *Nepal Living Standards Survey 2003/2004*. Central Bureau of Statistics, Kathmandu, Nepal.

Cervero, R., Golub, A. and Nee, B. (2007). City Car Share: Longer-Term Travel Demand and Car Ownership Impacts. *Transportation Research Record* 1992, 70-80.

Chapman, L. (2007). Transport and climate change: a review. *Journal of Transport Geography* 15, 5: 354-367

Coffin, A. W. (2007). From road kill to road ecology: A review of the ecological effects of roads. *Journal of Transport Geography* 15, 5: 396-406

Colvile, R. N., Hutchinson, E.J., Mindell, J.S. and Warren, R.F. (2001). The transport sector as a source of air pollution. *Atmospheric Environment* 35, 9: 1537-1565

Corral, L. and Reardon, T. (2001). Rural nonfarm incomes in Nicaragua. *World development*, *29*(3), 427-442.

Coyle, E., Huws, D., Monaghan, S., Roddy, G., Seery, B., Staats, P., Thunhurst, C., Walker, P. and Fleming P. (2009). Transport and health– a five-country perspective. *Public Health* 123, 1: 21-23

Creightney, C.D. (1993). Transport and Economic Performance: A Survey of Developing Countries, Technical Paper No.232, Africa Technical Department, World Bank, Washington D.C., USA.

Cummins, P. (2002). Access to Health care in the Western Cape. *The Lancet*, *360*, s49 s50.

Dawson, J. and Barwell, I. (1993). *Roads Are Not Enough: New Perspectives On Rural Transport Planning In Developing Countries*. Intermediate Technology Publications Ltd (ITP).

De Janvry, A. and Sadoulet, E. (2001). Income strategies among rural households in Mexico: The role of off-farm activities. *World development*, *29*(3), 467-480.

Deininger, K. and Okidi, J. (2003). Growth and poverty reduction in Uganda, 1999–2000: Panel data evidence. *Development Policy Review*, *21*(4), 481-509.

Demirel, H., Sertel, E., Kaya, S. and Seker, D.Z. (2008). Exploring impacts of road transportation on environment: a spatial approach. *Desalination* 226, 1-3: 279–288

Dennis, R. (1998). *Rural Transport and Accessibility*. *A Synthesis Paper*. Geneva, International Labour Organization, Development Policies Department,

Department of Planning (2008). District Development Planning: Preparation of District Development Profile, Third Year Workshop Report. Department of Planning, KNUST, Kumasi.

Dercon, S. and Hoddinott, J. (2005). *Livelihood growth and links to market towns in 15 Ethiopian villages.* FCND Discussion Paper 194, Washington D.C; IFPRI

Dercon, S., Gilligan, D.O., Hoddinott, J. and Woldehanna, T. (2007). The Impact of Agricultural Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages. *American Journal of Agricultural Economics* 91, 4: 1007–1021

DFID (2000). Realising Human Rights for Poor People: Strategies for Achieving the International Development Targets. Target Strategy Paper: Department for International Development, London, UK

DFID (2003). Action research to evaluate the impact on livelihoods of a set of post-harvest interventions in Ghana's off-road settlement: focus on intermediate modes of transport (IMT). Department for International Development. London, UK

DFID (2002). *Transport's Role in Achieving the Millennium Development Goals,* DFID Transport Resource Centre Version 21 June 2002

Donnges, C. **(**1998**)**. *Rural road planning- recommendations for improving the rural road network in Lao PDR* (Issue Paper 3) Ministry of Communications, Transport, Post and Construction. Vientiane, Laos. United Nations Development Programme (UNDP)

Donnges, C. (2001). Rural Transport and Local Government Units How to Improve Rural Transport For The Rural Poor? *Transport and Communications Bulletin for Asia and the Pacific*, 71, 19-28.

Doran, J. (1996). *Rural Transport***.** London, IT Publications.

Duchin, F. and López-Morales, C. (2011). Policies and Technologies for a Sustainable Use of Water in Mexico: A Scenario Analysis. *Economic Systems Research* 24: (4) 387-407

Edmonds, G. (1998). *Wasted Time: The Price of Poor Access.* (ILO Rural Accessibility Technical Paper No. 3) Geneva, International Labour Organisation.

EFA (2005). Education for All the Quality Imperative. EFA Monitoring Report. UNESCO Publishing, Paris France

Eggleston, S. and Walsh, M. (n.d) *Emissions: Energy, Road Transport. Energy Sector*

Background Paper. Accessed at http://www.ipcc nggip.iges.or.jp_Road_ Transport. pdf on 4th March, 2012

Ellis, S. D. (1997). *Key Issues in Rural Transport in Developing Countries*, Transport Research Laboratory, and Overseas Development Administration, TRL Report 260. Berkshire, England

Engdayahu, A. (2007). National Energy Sector Greenhouse Gas Emissions of Ethiopia and Its Mitigation Analysis. Unpublished Thesis paper submitted for the Partial Fulfillment of Master of Science in Environmental Science, Faculty of Science, Addis Ababa University. Addis Ababa, Ethiopia: Addis Ababa University.

Escobal, J. and Ponce. C. (2002). *The Benefits of Rural Roads: Enhancing Income Opportunities for the Rural Poor*. (GRADE Working Paper 40). Lima, Grupo de Analisis para el Desarrollo.

Essakali, M. D. (2005). *Rural Access and Mobility in Pakistan: A Policy Note*. Tpt NoteTRN-28. Washington D.C., World Bank.

Fafchamps, M. and Hill, R.V. (2005). Selling at the Farm Gate or Travelling to the Market. *American Journal of Agricultural Economics* 87(3): 717-734

Fan, S. and Chang-Kang, C. (2005). Road Development Economic Growth and Poverty Reduction in China. *IFPRI Research Report 138*, Washington D.C. International Food Policy Research Institute.

Fan, S. and Chan-Kang, C. (2008). Regional road development, rural and urban poverty: Evidence from China. *Transport Policy*, 15, 5: 305-314.

Fan, S., Hazell, P. and Thorat, S. (1999*). Linkage between Government Spending, Growth and Poverty in Rural India.* Research Report 110, Washington D.C., IFPRI.

Fan, S., Zhang, L. and Zhang, X. (2002). Growth, Inequality and Poverty in Rural China: The Role of Public Investments. *IFPRI Research Report 125,* Washington, D.C. International Food Policy Research Institute.

Forster, G. (2008). Access to Health Services: Intermediate Modes of Transport in Resource Poor Areas. Presentation at the IFRID Conference Countries. Transport Solutions for Access to Healthcare in Rural Africa. Transaid London, England

Frankfort-Nachmias, C. and Nachmias, D. (1996). *Research Methods in Social Science,* 5th Edition, New York, St Martins Press Inc.

Gachassin, M., Najman, B. and Raballand, G. (2010). *The Impacts of Road Poverty Reduction: A Case Study of Cameroon*. The World Bank, African Region Policy Research Working Paper 5209, February 2010

Gannon, C. and Liu Z. (1997). *Poverty and Transport*. TWU-30, World Bank, Washington D.C. Transport, Water and Urban Development Department

Geurs, K. and van Wee, B. (2004). Accessibility Evaluation of Land use and transport strategies: Review and Research Directions. *Journal of Transport Geography* 12 (2): 127-140.

Ghana Statistical Service (2008). *Ghana Living Standards Survey*. Report of the fifth round (GLSS 5). Accra, Ghana Statistical Service.

Ghana Statistical Service (2012). *2010 Population and Housing Census. Summary Report of Final Results*. Accra, Ghana Statistical Service.

Ghana Statistical Service (2013). *2010 Population & Housing Census Report: Millennium Development Goals in Ghana.* Ghana Statistical Service, Accra.

Ghana Statistical Service (2008). *Ghana Living Standards Survey Report of the Fifth Round (GLSS 5),* Accra, Ghana Statistical Service.

Gibson, J., and Rozelle, S. (2002). *Poverty and access to infrastructure in Papua New Guinea. Department of Agriculture and Resource Economics*, UC Davis, Working Paper Series No. 1000

Global Transport Knowledge Partnership (2010). *Transport and the Millennium Development Goals,* accessed from http://www.gtkp.com/ theme.php? theme pgid=186, date accessed 13/03/2011.

Government of Ghana (2007). *National Water Policy*. Accra, Ministry of Water Resources, Works and Housing.

Government of Ghana (2010). Ghana Water and Sanitation Performance Report-2010. Accra, Ministry of Water Resources, Works and Housing.

Grieco, M., Ndalo, M., Bryceson, D., Porter, G. and McCray, T. (eds.) (2009). *Africa, Transport and the Millennium Development Goals: Achieving an Internationally Set Agenda* Newcastle-upon-Tyne: Cambridge Scholars.

Guers, K. and van Wee, B. (2004). Accessibility Evaluation of Land-Use and Transport Strategies: Review and Research Directions. *Journal of Transport Geography*, (12) 127-140

Hardeman, W., Van Damme, W., Van Pelt, Por I., Kim Van H. K. and Bruno, M., (2004). Access to healthcare for all? User fees plus a Health Equity Fund in Sotrikum, Cambodia. *Health Policy and Planning,* 19, 1: 22-32

Hays M. S., Kearns A. R. and Moran, W. (1990). Spatial Patterns of Attendance at General Practitioner Services. *Social Science and Medicine* 31: 773–781.

Heiman, G. (1999). Research methods in psychology. Boston: Houghton Mifflin Company.

Hettige, H. (2006). When do rural roads benefit the poor and how? An in-depth analysis based on case studies. Manila, Philippines. 44p. Accessed on 2nd March, 2012 at http://adbdev.org/sites/default/files/publications/29406/file/when-rural-roadsbenefit-poor.pdf

Hine, J. (2014). Good Policies and Practices on Rural Transport in Africa: Planning Infrastructure & Services. SSATP Africa Transport Policy Program, Working Paper No. 100. SSATP, World Bank, Washington DC

Hine, J. and Riverson, J. (2001). *The impact of feeder road investment on accessibility and agricultural development in Ghana.* Study commissioned by the Ghana Highway Authority as part of the Second Highway Project, Crowthorne, UK

Hoffman, M., Pick, W. M., Cooper, D. and Myers, J. E. (1997). "Women's Health Status and Use of Health Services in a Rapidly Growing Peri-Urban Area of South Africa". Accessed on 2nd January, 2012 at 4509011149-59

Holm-Hadulla, F. (2005). Why Transport Matters: Contributions of the Transport Sector towards Achieving the Millennium Development Goals. *Eschborn, Germany: GTZ/Federal Ministry for Economic Cooperation and Development*.

Howe, J. (1975). The Future of Surface Transport in Africa. *African Affairs*, 74 (296): 314–325

Howe, J. (2001). *Assessing the Impacts of Transport Infrastructure on Poverty Reduction.* Manilla, Asian Development Bank.

IFRTD Forum News (2004). Mainstreaming Gender in the Transport Sector. *International Forum for Rural Transport and Development* 11, 3: 1-4

Igbuzor, O. (2006). *The Millennium Development Goals: Can Nigeria meet the Goals in 2015?* A paper presented at the symposium on Millennium Development Goals and Nigeria: Issues, Challenges and Prospects organised by the Institute of Chartered Accountants of Nigeria (ICAN), Abuja District on 27th July, 2006 at Sheraton Hotel and Towers, Abuja.

Independent Evaluation Group (IEG) (1998). Feeder Roads in Brazil: The unexpected effects on Commodity Prices. The World Bank Group. Washington D.C, U.S.A

Institute for Applied Economic Research (2004). *Brazilian Monitoring Report on the Millennium Development Goals.* Brasília, Brazil*:* Institute for Applied Economic Research (IPEA)

Institute of Statistical, Social and Economic Research (2000). *The State of the Ghanaian Economy in 2000*, Accra, Ghana, University of Ghana Press.

International Centre for Environmental Management (ICEM) (2003). *Lao PDR National Report on Protected Areas and Development: Review of Protected Areas and Development in the Lower Mekong River Region*. Indooroopilly, Queensland, Australia.

Jacoby, H.G. (2000). Access to Markets and the Benefits of Rural Roads. *The Economic Journal* 110: 713 – 737

Jennings, M. (1992). *Study of the Constraints on Women"s Use of Transport in the Makete District, Tanzania*. Geneva, ILO.

Johnson, T. R., Walker, M. A. and Niebyl J. R. (1996). Preconception and Prenatal Care, in Obstetrics: Normal and Problem Pregnancies. 3rd ed., 161-183. Churchill Livingston, New York

Khandker, S. R., Bakht, Z. and Koolwal, G. B. (2006). The poverty impact of rural roads: Evidence from Bangladesh. *World Bank Policy Research Working Paper*, (3875).

Kyale. G., Olsen, B. E., Hinderaaker, S. G., Ulstein, M. and Bergsjo, P. (2005). Maternal Deaths in Developing Contries. A Preventable Tragedy. *Norsk Epidemiology* 15, 2: 141-149

Lanjouw, P., Quizon, J. and Sparrow, R. (2001). Non-Agricultural Earnings in Peri-Urban Areas of Tanzania: Evidence From Household Survey Data: *Food Policy*. 26(4): 385 - 403

Laumbach, R. J. and Kipen, H.M. (2012). Respiratory health effects of air pollution: Update on biomass smoke and traffic pollution. *Journal of Allergy and Clinical Immunology* 129, 1: 3-11

Lebo, J. and Schelling, D. (2002). Design and Appraisal of Rural Transport Infrastructure. *Ensuring Basic Access for Rural Communities.* World Bank Technical Paper No. 496. Washington D.C., The World Bank.

Lebo, J. and Schelling, D. (2001). *Rural Roads Economic Appraisal Methodology: Rural*

Transport Knowledge Base. Rural Travel and Transport Programme. Accessed on 15th April, 2013.

Leinbach, T.R. (1995). Transport and Third World Development: Review, Issues, and Prescription. *Transportation Research (Part A: Policy and Practice)* 29, 5: 337– 344

Levy, H. (2004). *Rural Roads and Poverty Alleviation in Morocco. Case Studies in Scaling Up Poverty Reduction*. The World Bank, Washington DC

Lin, J.Y. (2003). *Development Strategy, Viability and Challenges of Development in Lagging Regions*, China Center for Economic Research, Peking University, accessed from *siteresources.worldbank.org/DEC/ Resources/ 84797.../Lin.pdf* date accessed 07/04/2011.

Linneker, B. and Spence, N. (1996). Road transport infrastructure and regional economic development: the regional development effects of the M25 London orbital motorway. *Journal of Transport Geography* 4, 2: 77-96

Liu, X. (2000). 刘小东 *1990-2000 = Works of Liu Xiaodong 1990-2000*: [Beijing : s.n.]. Accessed on 3rd March, 2012 at http://www.worldcat.org/title/liu-xiaodong-1990-2000-works-of-liu-xiaodong-1990-2000/oclc/47274718

Loewe, M. (2012). *Post 2015: How to Reconcile the Millennium Development Goals (MDGs),* Bonn-Germany: German Development Institute.

Lokshin, M. and Yemtsovz, R. (2005). Has Rural Infrastructure Rehabilitation in Georgia Helped the Poor? *The World Bank Economic Review,* 19, 2: 311-333

Lucas, K., Davis, T. and Rikard, K. (1996). *Agriculture Transport Assistance Program: Impact Study. Dar Es Salaam*: Project Number 621-0166. Dar es Salaam, USAID.

Mabaya, E. (2009). Transportation Costs and Spatial Integration of Agricultural Commodity in Grieco, M., Ndulo, M., Bryceson, D., Porter, G. and McCray T. (eds). *Africa Transport and the Millennium Development Goals: Achieving on Internationally Set Agenda Pp. 32* Cambridge Scholars Publishing, Newcastle upon Tyne, UK.

Malmberg-Calvo, C. (1994). *Case Study on Intermediate Transport Bicycles and Rural Women in Uganda.* Sub-Saharan Africa Transport Policy Program. SSATP Working Paper No. 12. Washington D.C., The World Bank and Economic Commission for African.

Malmberg-Calvo, C. (1998). *Options for managing and financing rural transport infrastructure,* World Bank Technical Paper No 411. Washington D.C. The World Bank.

Martin, E., Shaheen, S. and Lidicker, J. (2010). Impact of Car sharing on household Vehicle Holdings. Results from North American Shared Use Vehicle Survey. *Transportation Research Record*, 2143, 150-158.

McCray, T. (Hg.) (2009). *Exploring the Components of "Accessibility" from a Transport and Health Perspective in Rural South Africa*. 12 Back Chapman Street, Newcastle upon Tyne, NE6 2XX, UK: Cambridge Scholars Publishing.

McQuaid, R. W. (Hg.) (2009). *Linking Transport to Employment: Pursuing the Millenium Development Goals*. 12 Back Chapman Street, Newcastle upon Tyne, NE6 2XX, UK: Cambridge Scholars Publishing.

Meng, J. (2004). Ghana's Development: Miracle or Mirage?. *History*, 107(6).

Mengistu, A. A. (2009). *The Roles of Human Capital and Physical Infrastructure on FDI Inflow: Empirical Evidence from East Asia and Sub Saharan Africa* , a paper prepared for CSAE Conference (Paper No. 122) , accessed from *www.csae.ox.ac.uk/conferences/2009-EDiA/papers/122-Mengistu.pdf, date access ed 07/04/2011.*

Miller, R. L. and Brewer, J. D. (2003). *A-Z of Social Research-Dictionary of Key Social Science*, Sage Publications, London.

Ministry of Finance and Economic Development (MoFED) (2010). 2010 MDGs Report; *Trends and Prospects for Meeting MDGs by 2015.* Addis Ababa, Ethiopia: Federal Republic and United Nations Development Programme (UNDP): Accessed on 4th March, 2012 at http://web.undp.org/africa/documents/mdg /ethiopia _september 2010.pdf

Ministry of Food and Agriculture (2011). *Facts and Figures*. Statistics, Research and Information Directorate (SRID), Accra

Ministry of Roads and Highways MRH (2014). Sector Medium-Term Development Plan (SMTDP): 2014-2017. Ministry of Roads & Highways, Accra, Ghana

Ministry of Transport (2008). *Baseline Studies and Impact Monitoring of Road Sector Development Programme Roads on Poverty Reduction in Ghana.* Vision Consult, Accra, Ghana.

Ministry of Manpower Youth and Employment (2007). Labour practices in cocoa production in Ghana (Pilot Survey) Accra: National Program for the Elimination of Worst forms of Child Labour in Cocoa (NPECLC), Ministry of Manpower

Mohan, D. (2008). Road traffic injuries: A Stocktaking. *Best Practice & Research Clinical Rheumatology* 22, 4: 725–739

Muiderman, K. (2013). *Post-2015: SDGs or Post-MDGs? Running up to the end of the MDG term.*. [Online] Available at: http://www.thebrokeronline.eu/Articles/Post2015-SDGs-or-Post-MDGs [Accessed 24 May 2014].

Mutua J., Ocheng, F., Oram, C. and Kaumbutho, P. (2003). *Engineering and Issues of IMT Adoption, Use and Servicing in Kenya*. Kenya Network for Draught Animal Technology. Nairobi, Kenya

NDPC (2014). 2013 Annual Progress Report: The Implementation of the Ghana Shared Growth and Development Agenda (GSGDA) (2010-2013), National Development Planning Commission, Accra. December 2014

NDPC (2010). Medium-Term National Development Policy Framework: Ghana Shared Growth and Development Agenda (GSGDA) (2010-2013), National Development Planning Commission, Accra. December 2010

NDPC (2003). *Ghana Poverty Reduction Strategy (2003 –2005), An Agenda for Growth and Prosperity* – Vol. 1, Analysis and Policy Statement 2003, Accra, National Development Planning Commission.

NDPC (2008). *Draft Long Term Development Plan, Vol. 1,* Towards a Development Policy Framework, Unpublished.

NDPC (2005). *Growth and Poverty Reduction Strategy (GPRS II) (2006 – 2009)*, Accra, National Development Planning Commission.

Njenga, P. (2014). Post MDGs: Supporting a Transport Related Sustainable Development Goal. Workshop for Dissemination of Knowledge on Rural Transport Planning, Monitoring and Evaluation. Forest Grove Dodowa, Accra.

Njenga, P. and Davis, A. (2003). Drawing the Road Map to Rural Poverty Reduction. *Transport Reviews* 23, 2: 217-242

Njenga, P. R. (2003). A Profile of Rural Transport Services in Kenya. *A Background Resource Paper for Rural Transport Services Project for Kenya.*

Nkum and Associates (2003). Poverty Profiling, Mapping and Pro-poor Programme Exercise Training Manual. Local Governance and Poverty Reduction Support Programme (LGPRSIP), Accra, Ghana

Ofori, G. (2010). Build Environment Research and the Millennium Development Goals in Laryea, S., Leiringer, R. And Hughes, W. (Eds) *Procs West Africa Built Environment Research* (WABER) Conference, 27-28 July 2010, Accra, Ghana, 925.

Olukotun, G. A. (2007). The Role of Local Government Areas in Rural Transport Financing. *Journal of Social Science*, 15(2): 147-152

Omamo, S. W. (1998). Transport costs and smallholder cropping choices: An application to Siaya District, Kenya. *American Journal of Agricultural Economics*, *80*(1), 116123.

Osuji, L.O. and Olowolayemo, S.O. (1998). The Impact of Trade Liberalization Policy on Sub-Saharan African Countries' Debt Burden. *African Economic and Business Review*, Vol. 1, Num 2, Fall 1998.

Ouman, S. and Herselman, M. E. (2008). E-health in Rural Areas: Case of Developing Countries. *International Journal of Biological and Life Sciences,* 4, 4: 194-200

Pasha, H. A. (2007). Pro-poor Policies. Accessed on 10th May, 2013 at *unpan1.un. org /intradoc/groups/public/documents/un/unpan005788.pdf*

Peet, R. and Hartwick, E. (2009). *Theories of Development. Contentions, Arguments, Alternatives*. New York: The Guilford Press.

Persson, A. (2008). Road traffic accidents in Ethiopia: magnitude, causes and possible interventions. *Advances in Transportation Studies* 15: 5-16

Phoutsavath, P. (n.d). Lao PDR Country Presentation: Road Safety in Laos. Accessed at http://www.wpro.who.int/nr/rdonlyres/6c7bc809-57b1-46fa-8b4ad1ec519fd172/0/laopres-entaton.pdf on 3rd March, 2012

Poku-Boansi, M., Ekekpe, E. and Bonney A. A. (2010). Combating Maternal Mortality in Gushegu District of Ghana, the Role of Rural Transportation. *Journal of Sustainable Development in Africa.* 12, 5: 274-283

Porter, G. (1997). Mobility and Inequality in Rural Nigeria: The Case of Off-Road Communities. *Tijdschrift voor Economische en Sociale Geografie* 88, 1: 65-76.

Porter, G. (2002). Living in a Walking World: Rural Mobility and Social Equity Issues in Sub-Saharan Africa. *World Development* 30, 2: 285–300

Raballand, G., Macchi, P. and Petracco, C. (2010). *Rural Road Investment Efficiency: Lessons from Burkina Faso, Cameroon, and Uganda.* Washington D.C.: World Bank

Raballand, G., Thornton, R., Yang, D., Goldberg, J., Keleher, N. and Muller, A. (2011). *Are rural road investments alone sufficient to generate transport flows? Lessons from a randomized experiment in rural Malawi and policy implications*. Policy Research Working Paper Series 5535, Washington D.C. The World Bank

Ravallion, M. and Chen, S. (2003). Measuring pro-poor growth. *Economics letters*, *78*(1), 93-99.

Rietveld, P. (1994). Spatial Economic Impacts of Transport Infrastructure Supply. *Transportation Research Part A: Policy and Practice* 28, 4: 329–341

Rigg, J. (2008). The Millennium Development Goals in Desai, V. and R. B. Potter (eds.) *The Companion To Development Studies*. pp 30-36. London: Hodder Education

Riverson, J. and Carapetis, S. (1991). *Intermediate Means of Transport in Sub-Saharan Africa, Its Potential for Improving Rural Travel and Transport.* World Bank Technical Paper Number 161, Africa Technical Department, Washington D.C, USA

Riverson, J., Kunieda, M., Roberts, P., Lewi, N. and Walker, W. M. (2006). The Challenges in Addressing Gender Dimensions of Transport in Developing Countries: Lessons from World Bank's Projects. *unpublished, World Bank (June 2006).*

Roberts, P., Shyam, K. C. and Rastogi, C. (2006). *Rural Access Index: A Key Development Indicators*. Transport Sector Board Transport Paper 10, World Bank, Washington D.C.

Robson, C. (2002). Real World Research: *A Resource for Social Scientists and Practitioners Researchers*. 2nd Edition. Blackwell Publishing Ltd. UK

Rondo, P.H.C. (2008). Brazil‘s Progress in Achieving the Millennium Development Goals. *Journal of Tropical Pediatrics* 54, 4: 217-219

Sachs, J. (2005). *The End of Poverty: Economic Possibilities for our time.* New York, United States of America: Penguin Press.

Sachs, J. D. (2012). From Millennium Development Goals to Sustainable Development Goals. *Viewpoint* 379: 2206-2211

Santos, G., Behrendt, H., Maconi, L., Shirvani, T. and Teytelboym, A. (2010): Externalities and economic policies in road transport. *Research in Transportation Economics* 28, 1: 2–45

Sarkar, A.K. and Ghosh, D. (2000). Meeting the Accessibility Needs of Rural Poor. *IASSI Quarterly* 18, 4: 1-5

Sarkar, H. (2007). The Nexus between Achieving the MDGs and Economic Growth: the role of policy. *Asia-Pacific Development Journal* 14, 1: 1-24

Sedegah, D., D. and Tuffour, M. (2014). Demand Responsive Approach (DRA): A Neoliberal Approach for Rural Water Delivery and Management in Ghana. *International Journal of Humanities and Social Studies* 2(2), 160-164

Sekyere South District Assembly (2013). The Composite Budget of The Sekyere South District Assembly for The 2013 Fiscal Year. Sekyere South District, Agona

Sekyere South District Assembly. (2013) Municipal *Medium Term Development Plan.* Sekyere South District Assembly, Agona

Shadish, W., Cook, T., & Campbell, D. (2002). Experimental and quasi-experimental designs for generalized causal inference. Boston: Houghton Mifflin Company

Sharma, B. R. (2008). Road traffic injuries: A major global public health crisis. *Public Health* 122, 12: 1399-1406.

Shriar, A. J. (2006). Regional integration or disintegration? Recent road improvement s in Pete´n, Guatemala: A review of preliminary economic, agricultural, and environmental impacts. *Geoforum* 37, 1: 104-112

Shumiye, A. (2010). Economic Returns of High Investment in Asphalt Road Construction Compared to Low_cost Access Options in an Agrarian Community. Transport in Mountains, an International Workshop. Kathmandu, Nepal

Sieber, N. (1998). Appropriate Transport and Rural Transport in Makete District, Tanzania. *Viewpoint* 6, 1: 69-73

Sieber, N. (1999*).* Transporting the Yield. Appropriate Transport for Agricultural Production and Marketing in Sub-Saharan Africa. *Transport Reviews*, 19, 3, 205–220.

Slavin, R. (2007). Educational research in an age of accountability. Boston: Pearson Education

Smith Rider, D., Gordon, A., Meadows, K. and Zwick, K. (2001). Livelihoods diversification in Uganda: patterns and determinants of change across two rural districts. *Food Policy*, 26: 421-435.

Smith, D.R., Gordon, A., Meadows, K. and Zwick, K. (2001). Livelihood diversification in Uganda: patterns and determinants of change across two rural districts‖, *Food Policy,* 26, 2001: 421-435

Starkey, P. (2005). *Methodology for the Rapid Assessment of Rural Transport Services. Seminar on Sustainable Access and Local Resource Solution*, 28th - 30th November, 2005, Bangkok.

Starkey, P., Ellis, S., Hine, J. and Ternell, A. (2002). *Improving Rural Mobility: Options for Developing Motorised and Nonmotorised Transport in Rural Areas*. World Bank Technical Paper 525. Washington DC, USA. World Bank

Stekelenburg, J., Lonkhuijzen, L. V., Spaans, W. and Roosmalen, J. V. (2006). Maternity waiting homes in rural districts in Africa; A cornerstone of safe motherhood?. *Current Women's Health Reviews*, *2*(4), 235-238.

Stifel, D. and Minten, B. (2008), Isolation and agricultural productivity. Agricultural Economics, 39: 1–15.

Strandberg, T. (1993). Makete Integrated Rural Transport Project. *Appropriate Technology*. 20, 1: 6-8

Swee, G. K. (2013). *The practice of economic growth*. Marshall Cavendish International Asia Pte Ltd.

Thomson, H., Jepson, R., Hurley, F. and Douglas, M. (2008). Assessing the unintended health impacts of road transport policies and interventions: translating research evidence for use in policy and practice. *BMC Public Health* 8, 339: 1-13.

Thorsen, D. (2012). Children Working in Commercial Agriculture: Evidence from West and Central Africa. Briefing paper No. 2, UNICEF West and Central Africa Regional Office, Dakar-Yoff, Senegal

Todaro, M.P. and Smith, S.C., (2009). *Economic Development*, Harlow, England, Pearson education Limited.

Uherek, E., Halenka, T., Borken-Kleefeld, J., Balkanski, Y., Berntsen, T., Borrego, C., Gauss, M., Hoor, P., Juda-Rezler, K., Lelieveld, J., Melas, D., Rypdal, K., and Schmid, S. (2010). Transport impacts on atmosphere and climate: Land transport. *Atmospheric Environment* 44, 37: 4772-4816

UN News Centre, September (2010). *Anti-poverty goals are ambitious but doable*, Ban stresses ahead of MDG summit. Accessed from http://www.un.org/ apps/news /story.asp?NewsID=35899, date accessed 07/04/2011

UNAIDS (2011). *The Millennium Development Goals (MDGs)*, access from *http://www.unaidsrstesa.org/tracking-progress/mdgs*, date accessed, 14/03/2011.

United Nations (2008). Millennium Development Goal Indicators. Accessed on 9th July 2014 at http://mdgs.un.org/unsd/mdg/Host.aspx?

United Nations (2011). *The Millennium Development Goals Report 2011*. New York, United States of America: United Nations.

United Nations (2013). *Report: The Future We Want.* New York: United Nation.

United Nations (2014). Outcome document–Open Working Group on Sustainable Development Goals. Accessed on 28th August, 2014 at http://sustainable development.un.org/focussdgs.html.

United Nations Development Programme (2014). The Millennium Development Goals Report 2014. Accessed on 9th July 2014 at http://www.gh-undp.org/content/ghana /en/home/library/MDGreports/the-millennium-dev't-goals-reports2014

United Nations Development Programme and National Development Planning Commission/Government of Ghana (2010), *2008 Ghana Millennium Development Goals Report*. United Nations Development Programme, Accra, Ghana

United Nations Development Programme and National Development Planning Commission/Government of Ghana (2012). *2010 Ghana Millennium Development Goals Report.* United Nations Development Programme, Accra, Ghana

Van de Walle, D. (2002). Choosing Rural Road Investments to Help Reduce Poverty. *World Development* 30, 4: 575-589

Van de Walle D. (2008). Impact Evaluation of Rural Road Project. World Bank. Washington, DC, U.S.A

Van de Walle, D. (2009). Impact Evaluation of Rural Road Projects. *Journal of Development Effectiveness*, Taylor & Francis Journals, 1(1): 15-36

Vandemoortele, J. (2002). *Are the MDGs feasible?* New York, United Nations Development Programme.

Vandemoortele, J. (2012). Advancing the Global Development Agenda Post-2015: Some Thoughts, Ideas and Practical Suggestions. New York: UN System Task Team on the Post 2015 UN Development Agenda.

Varian, H. R. (1999). *Intermediate Microeconomics: A Modern Approach.*5th Edition. New York W.W Norton & Company.

Vasconcellos, E.A. (1997). Rural transport and access to education in developing countries: policy issues. *Journal of Transport Geography* 5, 2: 127–136

Vincent, S. (2010). *Promoting Good Transport Policy to Assist in Achieving the MDGs in Sub-Saharan Africa*, accessed from http://www.mdg-review.org /index.php/ sections /42-transport-a-logistics/177-promoting-good-transport-policy-to-assist-inachieving-the-mdgs-in-sub-saharan-africa, date accessed 14/03/2010.

Warr, P. (2006). The Impact of Road Development on Poverty in the Lao People‘s Democratic Republic. *Asia-Pacific Development Journal* 13, 2: 1-24

Warr, P. (2010). Roads and Poverty in Rural Laos: An Econometric Analysis. *Pacific Economic Review* 15, 1: 152–169

Windle, J. and Cramb, R.A. (1997). Remoteness and rural development: economic impacts of rural roads on upland farmers in Sarawak, Malaysia. *Asia Pacific Viewpoint* 38, 1: 37–53

Wondemu, K.A. (2010). *Road Infrastructure and Rural Poverty in Ethiopia*. Unpublished Thesis Submitted for the Degree of Doctor of Philosophy Development and Economic Studies Department University of Bradford. University of Bradford: United Kingdom

World Bank (1993). *The East Asian Miracle: Economic Growth and Public Policy*. Oxford University Press.

World Bank (1994). *World Development Report: Infrastructure for Development*. London Oxford University Press

World Bank (1997). *Brazil: Impact Evaluation Report Feeder Roads in Bahia: Secondary and Feeder Roads Project* (Loan 1207-BR); Second Feeder Roads Project (Loan 1730-BR). New York. United States of America: The World Bank.

World Bank (1998). *Feeder Roads in Brazil*. World Bank Operations Evaluation Department. Summer 1998, No. 160

World Bank (2003). *Technical Note on Rural Transport and Community Driven Development*. The World Bank, Washington, D.C.

World Bank (2005). *Lao PDR Environmental Monitor.* Washington, DC, United States of America: The World Bank.

World Bank (2006). *Project Appraisal Document on a Proposed Credit in the Amount of SDR 41.1 Million to the Republic of Nicaragua for the Fourth Roads Rehabilitation and Maintenance Project*, Washington D.C,: World Bank.

World Bank (2010). Ethiopia‘s Infrastructure: *A Continental Perspective. Africa Infrastructure Country Diagnostic Country Report*, the International Bank for Reconstruction and Development. Washington, DC: World Bank.

World Bank (2013). Sub-Saharan Africa Transport: *"Linking People to Resources and Opportunities"*. Accessed 023/05/2014 from http://web.worldbank. org/WBSITE/ EXTERNAL/COUNTRIES/AFRICAEXT/0

World Bank (2014). *World Development Indicators. The World Bank*. Washington DC.

World Bank (2008). *Safe, Clean and Affordable Transport for Development, The World Bank Group"s Transport Business Strategy 2008 – 2012,* accessed from http://siteresources.worldbank. org/INTTRANSPORT/ .../Transport_Business_ Strategy_web.pdf date accessed 14/03/2011.

World Health Organisation (2004). *World Report on Road Traffic Injury Prevention: Summary*. Geneva, Switzerland: World Health Organization (WHO)

Zaid, W.G. (2011). Bridging the Gaps: Through Designing and Constructing Socially Responsive Road Infrastructure. Presentation delivered at Addis Ababa. Accessed on 04/03.2012 at http://siteresources.worldbank.org/ INTGENDER/ Resources/ 336003-1289616249857/Gebriel ERA Transport.pdf

Zimmerman, K., Mzige, A. A., Kibatala, P.L., Museru, L.M., Guerrero, A. (2012). Road traffic injury incidence and crash characteristics in Dar es Salaam: A population based study. *Accident Analysis and Prevention* 45, 2: 204–210

APPENDICES

APPENDIX 1.1: Sample Size Determination

Given the total number of households for the years 1984 and 2000; the rate of growth was determined using the exponential growth rate model:

$$P_t = P_o e^{rt}$$

Where P_t is the future population, P_o is the base year (present) population; e is the base of natural logarithms or a constant (2.718), r is the rate of growth; and t is the time period between the two intercensal years.

For instance, given the total number of households of the years 1984 and 2000 for Adoowa to be 2289 and 2345 respectively, the rate of growth was determined as shown below;

$P_{2000} = P_{1984} 2.718_{(r)(16years)}$

$r = \text{In}\ (P_t/P_0)/t$ $r = \text{In}$

$(105/64)/16$ $r = 3.1\%$

Thus assuming that the growth rate remains the same through to the year 2013, the projected total number of households for the year 2013 will be;

$P_t = P_o e^{rt}$;   r is 3.1% (0.031); t is 13 years, and P_o is 105

$P_t = 105e_{(0.031)\ (13)}$

$P_{(2013)}$ = 156 households

This was thus used to obtain the study population of all the communities on the respective corridors. Having obtained a frame of 668 households on the Poano-Ntinanko-Adoowa Road Corridor, the sample size was derived at 95% confidence level as shown below:

$$n = \frac{N}{1 + N(a)^2}$$

Where: n= sample size; N= study population (total number of households; 1 = constant and a= the margin of error (0.05).

$$n = \frac{668}{1 + 668(0.05)^2}$$

$n = 250$households

Sample Distribution using Proportions

To obtain the sample size of the individual communities on the Agona-Wiamoase Corridor;

$$Proportion\ of\ Wiamoase\ = \frac{Total\ households\ of\ Wiamoase}{Total\ study\ population\ on\ the\ corridor} * Total\ sample\ size\ (n)\ on\ corridor$$

$$Sample\ size\ of\ Adoowa\ (n) = \frac{156}{668} * 250$$

$$n = 58$$

A sample size of 58 households was thus interviewed in Adoowa. This was done to obtain the proportion of all communities on the respective corridors.

APPENDIX 2.1: MDGs, Targets and Indicators

MDG	Target	Indicators

Eradicate Extreme Hunger and Poverty	**1.** Halve, between 1990 and 2015, the proportion of people whose income is less than $1 a day	**1.** Proportion of population below $1 (1993 PPP) per day **2.** Poverty gap ratio **3.** Share of poorest quintile in national consumption
	2. Halve, between 1990 and 2015, the proportion of people who suffer from hunger	**4.** Prevalence of underweight children under five years of age **5.** Proportion of population below minimum level of dietary energy consumption
Achieve Universal Primary Education	3. Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	**6.** Net enrolment ratio in primary education **7.** Proportion of pupils starting grade 1 who reach grade 5 **8.** Literacy rate of 15-24 year-olds
Promote Gender Equality and Empower Women	**4.** Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015	**9.** Ratio of girls to boys in primary, secondary and tertiary education **10.** Ratio of literate women to men, 15-24 years old **11.** Share of women in wage employment in the nonagricultural sector **12.** Proportion of seats held by women in national parliament
Reduce Child Mortality	**5.** Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	**13.** Under-five mortality rate **14.** Infant mortality rate **15.** Proportion of 1 year-old children immunized against measles
Improve Maternal Health	**6.** Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	**16.** Maternal mortality ratio **17.** Proportion of births attended by skilled health personnel
Combat HIV/AIDS, Malaria and other diseases	**7.** Have halted by 2015 and begun to reverse the spread of HIV/AIDS	**18.** HIV prevalence among pregnant women aged 15-24 years **19.** Condom use rate of the contraceptive prevalence rate **19a.** Condom use at last high-risk sex (UNICEF-WHO) **19b.** Percentage of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS **19c.** Contraceptive prevalence rate **20.** Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years
	8. Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	**21.** Prevalence and death rates associated with malaria **22.** Proportion of population in malaria-risk areas using effective malaria prevention and treatment measures **23.** Prevalence and death rates associated with tuberculosis **24.** Proportion of tuberculosis cases detected and cured under DOTS (internationally recommended TB control strategy)

Appendix 2.1 Continued: MDGs, targets and indicators

MDG	Target	Indicators

Ensure Environmental Sustainability	**9.** Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources	**25.** Proportion of land area covered by forest **26.** Ratio of area protected to maintain biological diversity to surface area **27.** Energy use (kg oil equivalent) per $1 GDP (PPP) **28.** Carbon dioxide emissions per capita (UNFCCC, UNSD) and consumption of ozone-depleting CFCs (ODP tons) **29.** Proportion of population using solid fuels
	10. Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	**30.** Proportion of population with sustainable access to an improved water source, urban and rural **31.** Proportion of population with access to improved sanitation, urban and rural
	11. Have achieved by 2020 a significant improvement in the lives of at least 100 million slum dwellers	**32.** Proportion of households with access to secure tenure
Develop a Global Partnership for Development	**12.** Develop further an open, rule-based, predictable, nondiscriminatory trading and financial system (includes a commitment to good governance, development, and poverty reduction both nationally and internationally) **13.** Address the special needs of the Least Developed Countries (includes tariff- and quota-free access for Least Developed Countries? exports, enhanced program of debt relief for heavily indebted poor countries [HIPCs] and cancellation of official bilateral debt, and more generous official development assistance for countries committed to poverty reduction) **14.** Address the special needs of landlocked developing countries and small island developing states (through the Program of Action for the Sustainable Development of Small Island Developing States and 22nd General Assembly	**Official development assistance (ODA)** **33.** Net ODA, total and to LDCs, as percentage of OECD/Development Assistance Committee (DAC) donors' gross national income (GNI) **34.** Proportion of total bilateral, sectorallocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation) **35.** Proportion of bilateral ODA of OECD/DAC donors that is untied **36.** ODA received in landlocked developing countries as a proportion of their GNIs **37.** ODA received in small island developing States as proportion of their GNIs **Market access** **38.** Proportion of total developed country imports (by value and excluding arms) from developing countries and from LDCs, admitted free of duty **39.** Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries **40.** Agricultural support estimate for OECD countries as percentage of their GDP **41.** Proportion of ODA provided to help

	provisions)	build trade capacity **Debt sustainability** **42.** Total number of countries that have reached their Heavily Indebted Poor Countries Initiative (HIPC) decision points and number that have reached their HIPC completion points (cumulative) **43.** Debt relief committed under HIPC initiative **44.** Debt service as a percentage of exports of goods and services
	15. Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term	
	16. In cooperation with developing countries, develop and implement strategies for decent and productive work for youth	**45.** Unemployment rate of young people aged 15-24 years, each sex and total
	17. In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries	**46.** Proportion of population with access to affordable essential drugs on a sustainable basis
	18. In cooperation with the private sector, make available the benefits of new technologies, especially information and communications technologies	**47.** Telephone lines and cellular subscribers per 100 population **48.** Personal computers in use per 100 population and Internet users per 100 population

Source: Adapted from UN (2008) mdgs.un.org/unsd/mdg/Host.aspx?content=indicators/officialList.htm

Appendix 2.2: Sustainable Development Goals and Targets

Goals	Targets
SDG1: End Extreme Poverty including hunger	Target 1a: End extreme poverty, including absolute income poverty ($1.25 or less per day)
	Target 1b: End hunger and achieve food security, appropriate nutrition, and zero child stunting

	Target 1c: Provide enhanced support for highly vulnerable states and Least Developed Countries, to address the structural challenges facing those countries, including violence and conflict.
SDG2: Achieving Development within Planetary Boundaries	Target 2a: Each country reaches at least the next income level and promotes decent work.
	Target 2b: Countries report on their contribution to planetary boundaries and incorporate them, together with other environmental and social indicators, into expanded GDP measures and national accounts.
	Target 2c: Rapid voluntary reduction of fertility through the realization of sexual and reproductive health rights in countries with total fertility rates above [3] children per woman and a continuation of voluntary fertility reductions in countries where total fertility rates are above replacement level.
SDGs 3: Ensure Effective Learning for all Children and Youth for life and Livelihood	Target 3a: All children under the age of 5 reach their developmental potential through access to quality early childhood development programs and policies.
	Target 3b: All girls and boys receive quality primary and secondary education that focuses on a broad range of learning outcomes and on reducing the dropout rate to zero.
	Target 3c: Ensure that all youth transition effectively into the labor market.
SDG4: Achieve Gender Equality, Social Inclusion and Human Rights	Target 4a: Monitor and end discrimination and inequalities in public service delivery, the rule of law, access to justice, and participation in political and economic life on the basis of gender, ethnicity, religion, disability, national origin, and social or other status.
	Target 4b: Reduce by half the proportion of households with incomes less than half of the national median income (relative poverty).
	Target 4c: Prevent and eliminate violence against individuals, especially women and children.

SDG5: Achieve Health and Wellbeing at all age	Target 5a: Ensure universal coverage of quality healthcare, including the prevention and treatment of communicable and non-communicable diseases, sexual and reproductive health, family planning, routine immunization, and mental health, according the highest priority to primary health care.
	Target 5b: End preventable deaths by reducing child mortality to [20] or fewer deaths per 1000 births, maternal mortality to [40] or fewer deaths per 100,000 live births, and mortality under 70 years of age from non-communicable diseases by at least 30 percent compared with the level in 2015.
	Target 5c: Implement policies to promote and monitor healthy diets, physical activity and subjective wellbeing; reduce unhealthy behaviors such as tobacco use by [30%] and harmful use of alcohol by [20%].
SDG6: Improve Agriculture Systems and Raise Rural Prosperity	Target 6a: Ensure sustainable food production systems with high yields and high efficiency of water, soil nutrients, and energy; supporting nutritious diets with low food losses and waste.
	Target 6b: Halt forest and wetland conversion to agriculture, protect soil resources, and ensure that farming systems are resilient to climate change and disasters.
	Target 6c: Ensure universal access in rural areas to basic resources and infrastructure services (land, water, sanitation, modern energy, transport, mobile and broadband communication, agricultural inputs, and advisory services).
SDG7: Empower Inclusive, Productive and Resilient Cities	Target 7a: End extreme urban poverty, expand employment and productivity, and raise living standards, especially in slums.
	Target 7b: Ensure universal access to a secure and affordable built environment and basic urban services including housing; water, sanitation and waste management; low-carbon energy and transport; and mobile and broadband communication.

	Target 7c: Ensure safe air and water quality for all, and integrate reductions in greenhouse gas emissions, efficient land and resource use, and climate and disaster resilience into investments and standards.
SDG 8: Curb human induced climate change and ensure sustainable energy	Target 8a: Decarbonize the energy system, ensure clean energy for all, and improve energy efficiency, with targets for 2020, 2030 and 2050.
	Target 8b: Reduce non-energy related emissions of greenhouse gases through improved practices in agriculture, forestry, waste management, and industry.
	Target 8c: Adopt incentives, including pricing greenhouse gases emissions, to curb climate change and promote technology transfer to developing countries.
SDG9: Secure Ecosystem Services and Biodiversity, and Ensure Good Management of Water, Oceans, Forests and Natural Resources	Target 9a: Secure ecosystem services by adopting policies and legislation that address drivers of ecosystem degradation, and requiring individuals, businesses and governments to pay the social cost of pollution and use of environmental services.
	Target 9b. Participate in and support regional and global arrangements to inventory, monitor, and protect ecosystem services and environmental commons of regional and global significance and curb trans boundary environmental harms, with robust systems in place no later than 2020.
	Target 9c: All governments and businesses commit to the sustainable, integrated, and transparent management of water, agricultural land, forests, fisheries, mining, and hydrocarbon resources to support inclusive economic development and the achievement of all SDGs
SDG10: Transform Governance and Technologies for Sustainable Development	Target 10a: Governments (national and local) and major companies support the SDGs, provide integrated reporting by 2020, and reform international rules to achieve the goals

	Target 10b: Adequate domestic and international public finance for ending extreme poverty, providing global public goods, capacity building, and transferring technologies, including 0.7 percent of GNI in ODA for all high income countries, and an additional $100 billion per year in official climate financing by 2020.
	Target 10c: Accelerate adoption of new technologies for the SDGs.

Source: Adapted from Sustainable Development Solution Network (SDSN), 2014

Appendix 3.1: Interview Guide for Transport/Vehicle Operators

Community……………………………………..

Name of Station………………………………………………………….

Trip (origin and destination)………………………………………

1. How many trips do you make daily
   a. 4 { } b.5 { } c. 6 { } d.7 { } e. other(specify)…………

2. How long does it take you to make a trip (on this corridor) in

   km……………………

3. What is the travel time per trip?……………………………………………

4. How many passengers are conveyed per trip

   a. 4 { } b. 15 { } c. 30{ } d.45 e. other(specify)……………

5. How much is the fare per passenger/Freight on this corridor………………/……………………….
6. How much do you make per day? (GH¢)………………

7. How much do you spend on vehicle maintenance per week/per month

   (GH¢)……………

Appendix 3.2: Interview Guide for Passengers

Community………………………………………………..

Name of Station…………………………………………………………………

Trip (Origin to Destination)……………………………………………………………

1. How many times do you travel

   ……………………………………………………………………………..

   a)per week …………. B) per month……………………………………………..

2. How long does it take you to make a trip (on this corridor) in km………………

3. What is the travel time per trip (from origin to destination)?......................................

4. How much do you pay per trip?...

5. How much do you pay for freight?..

6. Has the improvement on the road impacted on your activities? Yes or No

   6a) If yes, in what ways…………………………………………………………

i) On the fares charged ii) On frequency of travel iii) On waiting time iv) Others specify…………………………………………………

Appendix 3.3: Interview Guide for District Health Directorate

DEPARTMENT OF PLANNING

Kwame Nkrumah University of Science and Technology, Kumasi

District Health Directorate

1. How many health facilities are in your district? ....

Name of facility	Location	Condition			Remarks for condition	ownership	
		good	Satisfactory	Poor		Private	public

2. Do you organize any outreach programme? ☐Yes ☐No

3. If yes name,

Type of outreach programme	Number of times organized in a year	Beneficiary communities	patronage	Source of funds

4. If no, why are they not organized? ……………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………

5. Staffing in the district

Staff	Number
Doctors	
Trained nurses	
Medical assistants	
Ward Assistants	

6. Top ten diseases

Commonest disease	Number of cases recorded	Percentage

Variable	2000	2001	2002	2003	2004	2005	2006	2007	2008
Infant mortality rate									
Maternal mortality rate									
Birth rate									
Under five mortality rate									

7. What are some of the problems you encounter with regard to the NHIS? …………….

....

8. How do you think these problems can be addressed? …………………………………

……………………………………………………………………………………………

9. What has been the impact of the scheme in the district? (give statistical evidence)

………………………………………………………………………………………………

10. How many PLWHA (People Living with HIV/AIDs) do you have in the district?......

Top five communities with PLWHA

Community	Number of PLWHA	Reasons

11. HIV cases

Cases	Year																	
	2000		2001		2002		2003		2004		2005		2006		2007		2008	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Number of HIV tested																		
Number of positives																		

12. HIV/AIDS prevention and management programmes

HIV/AIDS programmes	Number of beneficiaries	Purpose		Source of fund	Kind of support
		Prevention	Management		

13. What are the major problems faced by the health sector in the district? ………………

……

14. How can these problems be solved? …………………………………………………

15. What are your priorities with regard to health in the district? …………………………

……

……

Appendix 3.4: Interview Guide for Health Institutions

DEPARTMENT OF PLANNING

Kwame Nkrumah University of Science and Technology, Kumasi

HEALTH FACILITY

1. What is the name of your health facility?…………………………………………..

   ……………………………………………………………………………………

2. What is the ownership?...

3. Staffing

Staff	Number
Doctors	
Trained nurses	
Ward Assistance	
Medical assistant	

4. What is the average OPD attendance daily? ……………………………………….

5. What percentage of these people is registered under the NHIS? ………………..

6. What are the problems you encounter with the use of the scheme? ……………..

   ……………………………………………………………………………………

7. How do you think these problems can be solved?

   ……………………………………………………………………………………

8. Major logistics

Type of logistic	Number available	Number required

9. How do you assess health service delivery in this facility? a. excellent b. good c. fair d. poor

10. Give reason for the choice above. …………………………………………………

11. Top ten diseases

Commonest disease	Number of cases recorded	Percentage

12. HIV cases

Cases	Year				
	2005	2006	2007	2008	2009
Number of HIV tested					
Number of positives					

13. What are some of the donors and partners to this facility?

Donor/ Partners	Type of Assistance

14. Complete the table below

Variable	2007	2008	2009	2010	2011
Infant mortality rate					
Maternal mortality rate					

Appendix 3.5: Interview Guide for Department of Feeder Roads

1. Name of Road………………………………………………………….

2. When was the road rehabilitated? ……………………………………….

3. Has it ever been maintained since the rehabilitation?
 a. Yes { } b. No { }

4. If Yes when?.................................

5. If No why?..

6. Do you have any future plans for feeder roads identified?

a. Yes { } b. No { }

6i. If Yes what are the schedules

6ii. If No, why?..

7. Road Maintenance

Type of Maintenance	Frequency	Cost of Maintenance (Unit Rates/ per km)
Rehabilitation		
Routine		
Periodic		

8. Is the community involved in maintenance of local roads?

a. Yes { } b. No { }

If Yes, what are the roles the community performs…………………………………….....

…………………………………………………………………………………………………

Appendix 3.6: Interview Guide for Educational Institutions

1)Name of the school ....

2) Year of establishment ....

3) Type of ownership ....

Private [ ] 1 Public [ ] 2

Enrolment

The population of the school for the past five academic years?

Year	**Pre-school**			**Primary (1 – 6)_**			**Junior High School**		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
2008/2009									
2009/2010									
2010/2011									
2011/2012									
2012/2013									

Performance in Basic Education Certificate Examination

Year	Males		Female		Total	
	Number presented	Percentage passed	Number Presented	Percentage passed	Number	Percentage Passed
2008/2009						
2009/2010						
2010/2011						
2011/2012						
2012/2013						

Students" population as against number of classrooms and teachers

Level	Number of pupils/students	Number of classrooms	Number of Teachers					
			Professional		Nonprofessional		Total	
			Male	Female	Male	Female	Male	Female
KG1								
KG2								
Primary 1								
Primary 2								
Primary 3								
Primary 4								
Primary 5								
Primary 6								
JHS 1								
JHS 2								
JHS 3								
Total								

Number of desks versus number of pupils/students

Level	Number of pupils/students	Number of desks	Pupil: desk ratio
KG1			
KG2			
Primary 1			
Primary 2			
Primary 3			
Primary 4			
Primary 5			
Primary 6			
JHS 1			
JHS 2			
JHS 3			
Total			

Number of textbooks (Primary 1 to 6)

Level	**Primary**					
	1	2	3	4	5	6
English						
Maths						
Religious Education						
French						
Arts						
Music and Dance						

Citizenship Education						
Twi						
ICT						
Environmental Studies						

Number of textbooks (JHS 1 to JHS 3)

Level	**JHS**		
	1	2	3
English			
Maths			
Social Studies			
Integrated Science			
ICT			
Religious and Moral Education			
French			
Ghanaian Language and Culture			
Basic Designing and Technology Pre-tech Home economics Visual Arts			
Other (specify)			

(4)Do pupils/students attend school regularly?

a. Yes b. No

(i) If no, why? ....

(ii) if no how can it be solved in your own opinion? ....

5) What is the school drop-out rate? ....

(i) What is being done about it? ....

Conditions of the classroom infrastructure (observe)

Facility	Condition
Roofing	
Walls	
Floor	
Doors/windows	
Toilet/urinal	
Others (specify)	

Availability of other facilities

Facility	Tick (√)	Condition
Library		
Play ground		
Toilet and Urinal		
Water		
Others (specify)		

6) Does the school get any external support?

a. Yes   b. No

i) If yes, specify the kind of support...

7) Which body is responsible for the supervision of the school? ....

8) How often is the supervision conducted? ....

9) Does the school have a P.T.A?

a. Yes   b. No

i) If yes, how do they contribute to the development of the school?

....

10) Does the school have a School Management Committee?

a. Yes b. No

i) If yes, how do they contribute to the development of the school?

....

11) What are the problems facing the school? ....

12) What can be done to address the above mentioned problems?

....
....
....

Appendix 3.7: Interview Guide for District Educational Directorate (Formal Education)

FORMAL EDUCATION

1. What is the vision of this directorate?

…………………………………………………………………………………

…

2. What is the mission of this directorate?

   ………………………………………………………………………………………

3. What are the key roles of this directorate?

   ………………………………………………………………………………………

4. How many schools are in the District?…………………………………………………

5. What are the categories of these schools and their average teacher-pupil ratio?

CATEGORY	NUMBER	TEACHER-PUPIL RATIO
Pre-school		
Primary		
JHS		
SHS		
Vocational/Technical		
Tertiary		

6. What are their ownership types?

Category	No. of Private	No. of Public
Pre-school		
Primary		
JHS		
SHS		
Vocational/Technical		
Tertiary		

7. How are the schools distributed in the Districtl?

   a) Urban…………………………

   b) Rural…………………………..

   c) District Capital………………….

8. What are the conditions of the existing facilities? Tick appropriately

G-Good (Facility is usable with auxiliary facilities),

F-Fair (facility is good but not all auxiliary facilities are available),

P-Poor (Facility has no auxiliary facilities)

Facility	Pre-school			Primary			JHS		
	G	F	P	G	F	P	G	F	P
Classrooms									
Library									
Workshop									

Recreational Facilities									
Laboratory									
Toilet/Urinal									
Staff Accommodation									
Refuse Disposal Site									
Percentage (%)									

9. What is the educational status of the people in the district?

Sex	Literacy Rate	Illiteracy rate
Male		
Female		

10. What is the level of enrolment over the last three years?

Category	2010		2011		2012	
	M	F	M	F	M	F
Pre-school						
Primary						
JHS						

11. What is the BECE performance over the years?

Year	Total no. of candidates	No. that passed:			
		Maths	Science	English	Social
2010					
2011					
2012					

12. What is the percentage coverage of the School Feeding Programme in the district?

…………………………………………………………………………………………………

13. How many schools are benefiting from the School Feeding Programme?

……………………………………………………………………………………………

14. How many schools benefit from the Free School Uniform Project?

....

15. How many schools benefit from the free exercise books distribution?

……………………………………………………………………………………..

16. What is the impact of these programmes on enrolment level?

……………………………………………………………………………………

17. Are there any other government educational programmes in the district? a. Yes b. No

18. If yes, what are they?

i…………………………………………………………………………………………

ii…………………………………………………………………………………………

iii…………………………………………………………………………………………

iv…………………………………………………………………………………………

19. Are there incidence of school drop out in this district?

a. Yes b. No

20. If yes what is the rate of the drop out?

…………………………………………………………………………………………

21. Are there programmes for the promotion of girl child education in the district?

a. Yes b. No

22. If yes, what are they?

I…………………………………………………………………………

II…………………………………………………………………………

III…………………………………………………………………………..

23. What is the impact of those programmes on girl child education in the district?

…………………………………………………………………………………………

24. What are the key problems facing education in this district?

…………………………………………………………………………………………

…………………………………………………………………………………………

24. What are the key educational priorities (needs) of the district?

i…………………………………………………………………………………………

ii…………………………………………………………………………………

iii…………………………………………………………………………………

iv…………………………………………………………………………………

25. How are public schools supervised in the district?

…………………………………………………………………………………………

…………………………………………………………………………………………………

Appendix 3.8: Interview Guide for District Coordinating Director (DCD)/ District Planning Officer (DPO)

1. When was the district assembly established?

……………………………………………………………………………………………………

2. How is your organizational structure? (Request for a copy)

……………………………………………………………………………………………………

3. Please complete the table below

Departments in the Assembly	No of staff (s)	Functions

4.

Problems in the District	Measures put in place to alleviate the problems	Development Priorities

5. Stakeholders in the district and their functions.

Development Partners	Functions
(i)	
(ii)	
(iii)	
CBO‘s	
NGO‘s	

6. On-going projects

Projects	**Sector**	**Source of Funds**	**Status**	**Reasons**

16. What number of women staff do you have in the district assembly? …………………

18. What number of male staff do you have in the district assembly?

…………………………………………………………………………………………………

19. Do people in the district actively participate in decision making?

Yes ( )   No ( )

If yes in what form

…………………………………………………………………………………………………

20. What mechanisms have the D.A put in place to ensure that participation takes place?

…………………………………………………………………………………………………

21. What problems does the district assembly face in its bid to ensure participation?

…………………………………………………………………………………………………

22. Are women in the district encouraged to participate in any decision making process?

Yes ( )   No ( )

25. If yes how do they participate in the decision making process?

………………………………………………...

Appendix 3.9: Interview Guide for Uniit Committee

1. What is the number of unit committees and their composition in the district?

…………………………………………………………………………………………….....………

2. What is the average number of males and females in each unit committee?

Male ………….. Female ……………

3. How effective is the unit committee?

…………………………………………………………………………………………………
…………………………………………………………………………………………………
……

4.

Major problems facing the unit committees	Measures employed to address these problems

5. What are the contributions of the unit committee to development in the district?

…………………………………………………………………………………………………
…………………………………………………………………………………………………

6. What are some of the ongoing projects of the committee?

………………………………………………………………………………………………

7. What are the abandoned projects of the district?

…………………………………………………………………………………………………

8. Reason for the above (abandoned projects)

…………………………………………………………………………………………………

9. What are the sources of funds for the committee?

…………………………………………………………………………………………………
………………………………………………………………………………………………

Appendix 3.10: Interview Guide for Communtiy Level Survey

Name of community…………………………………

1. What is the travel time in minutes from the initial point of the road to the final point?

   ……………………….

2. How many vehicles ply the road in a day?

3. How often do they operate?
4. Cost per person from here to the next community
5. Cost per freight
6. Has the road been useful to the community? Yes or No. If Yes, how?

   ………………………………………………………………………….

Number of facilities	Number in Community	Level
Schools		
Health		
Market		
Bank		
Electricity		
Toilet		
Water point		

Appendix 3.11: Household Questionnaire

Background of Interviewer and Respondent

Name of Interviewer: ……………………………………………………………………

Place of Interview: Community/Village ………………………………………………….

Name of Road project ………………………….District………………………………..

Region ………………………………………….

Date of Interview: ………………………………………………………………………..

Name of Respondent: ……………………………Age……………Sex………

House Number: ………

1. **HOUSEHOLD CHARACTERISTICS**

Complete the table below

Names of Household Members	Age	Sex		Marital Status	Occupational Status	Type of Employment	Relationship to Head of Household	Highest Education Level Attained	Income Per Month(GH¢)
		Male	Female						
1.									
2.									
3.									
4.									
5.									

Note: (Please fill the cells with the appropriate codes listed below)

Marital Status	Occupation	Relationship to Head of Household	Education
1. Single Education	1. Service (Formal)	1. Head	1. None/No Formal
2. Married	2. Service (Informal)	2. Spouse	2. Primary
3. Divorced	3. Industry	3. Son	3. JHS
4. Separated	4. Agriculture	4. Daughter	4. SHS
5. Widowed	5. Unemployed	5. Foster Child	5. Technical/Vocational
6. Non Related	6. Tertiary		

Type of Employment

1. Employed
2. Seasonal Employment

3. Unemployed

ECONOMIC ACTIVITIES

2. If employed, which type of economic activity are you engaged in?

3. Agriculture { } b. Industry { } c. Service formal { } d. Service e. informal { }

A) Agriculture(For People Engaged in Agric as a major Employment)

4. Are you engaged in Agriculture as your major occupation?

a. Yes { } b. No { }

b. If into Agriculture, which type of agricultural activity are you engaged in?

a. Crop farming { } b. Animal farming(Livestock/Poultry){ }

c. Fishing { } d. Other (specify……………………..

Crop Farming

Type of Crop	Acreage under Cultivation	Unit of output (spec.)	Total Output	Quantity Consumed	Quantity Sold	Quantity Lost	Unit Cost GH¢	Point of Sale (Spec. Mkt)	Distance to Point of Sale (Spec. Mkt)

5. What type of Storage facility do you use?...

6. How much does it cost to store your produce? (if applicable) GH¢..............................

i. Animal Farming

Type of Livestock	Number in Stock	Yearly Additions	Number Consumed	Number Sold	Number Lost*	Point of Sale (Spec. Mkt)	Distance to Point of Sale (Spec. Mkt)

7. Excluding household labour, land and marketing costs, show in the table below the inputs used for agricultural production. Including items such as non-household labour, fertiliser, chemicals, animal feed, use of tractors, veterinary services their unit prices and their sources.

Type of inputs used	Unit Prices	Quantity used/year	Source of purchase	Distance
Crops				
Livestock				

8. What are the predominant causes of your produce loss?

a) Weather [ ]
b) Inaccessible road during harvest time therefore no vehicles [ ]
c) Roads are passable to vehicles but no transport services [ ]
d) Lack of adequate storage space [ ]
e) Lack of appropriate storage technology (e.g. insecticide) [ ]
f) Lack of agro-processing facilities [ ]
g) Pest and Disease [ ]

Applicable to Both crop farming and animal rearing

9. What is the average amount you spend on your farm in GH¢?

a. Per day……… b. per week…………c. per month………... c. per season…………….

10. What is the average amount you incur in transporting your produce to market centres by vehicles or carts? (GH¢)…………………………..

11. Do you engage the services of middlemen in selling your produce?

a. Yes { } b. No { }

12. Give reasons for your answer above …………………………………………………..
………………………………………………………………………………………………

13. Do you encounter any problems in dealing with middlemen?
a. Yes { } b. No { }

14i. If Yes state the problems

………………………………………………………………………………………………

14. Do you have access to extension officers?

a. Yes { } b. No { }

15i. If Yes what are the services you enjoy? ………………………………

15. How frequent do the Extension Officers visit? ……………………………………
16. What has been the effect of their visit on production?...
....

Marketing of Farm Produce

17. Where do you market your produce?

Location	Percentage of produce by value%
At home On the farm By roadside Local Market 1. (name) ………………………. Local Market 2. (name) ………………………. Urban Market (name) ………………………… Other (specify) ……………………..	

18. Indicate the main mode of transporting your produce to the point of sale?

a. From farm to home { } b. from farm to market { }

c. From farm to roadside { } c. from house to market { }

Scores

1. **Motorised**
2. **Non motorised**
3. **Head loading**

Off Season/Minor Employment

19. Do you have an off season/minor occupation apart from the agricultural activity?

Yes [ ] No [ ]

20b. If yes to (20), which sector are you engaged in?……………………………………

20(c) If no to (20), what do you do during the off farming period?………….

21. Have you been involved in community based activities during the off farm season? Yes [ ] No [ ]

22 b) If yes to (21), indicate which activity(ies) you have been involved in…

OTHER SECTORS (Not Applicable for those in major agricultural employment)

23. What type of commodity/service do you provide for sale?

a) Industry/ manufactured goods (specify)……………………………………

b) Agricultural produce /commodities (specify) …………………………………..

c) Personal services (hairdressing, barbering etc) …………………………………

d) Distributive trading (specify) ………………………………………………….

e) Others (specify) ………………………………………………………………..

24. Where is your activity located?………………………………………………..

24(b) Can you give any reason for your current location? Yes [ ] No [ ]

24(c) If yes to 24(b), indicate your reason for your current location?

…………………………………………………………………………………

…………………………………………………………………………………

25. Indicate in the table below the prices and sources of your inputs.

Inputs Used	Unit Price	Quantity Used/Year	Sources of Inputs (Specify Market)

26. How much do you spend on your work per day/week/month in GH¢ ……………..

27. How much do you earn on your work per day/week/month in GH¢ ……………..

28. What are the major problems affecting your activity?

………………………………………………………………………………………………

29. What solutions do you suggest to address these problems?

……………………………………………………………………………………………

30. **Complete the table below (For traders)**

Type of Good	Unit of output	Transport cost per unit	Origin	Destination	Distance	Mode of Transport	Income per wk/mth

FACILITIES

31. Which of the following facilities are available in your community?

Facility	Frequency of visit	Location of Facility		No. of times facility is used			Mode of Travel	Travel time in Minutes
				Daily	Weekly	Monthly		
Market								
School								
Health facility								
Water								
Electricity								
Telecommunication								
Firewood source								
Grinding Mill								

Frequency of Visit

1- Not frequent

2-Less frequent

3-Very frequent

Location of Facility

In-within community

Out-Outside community

32. Are there any challenges encountered in using these basic facilities?

a. Yes { } b. No { }

33. If Yes what are they?

a. Delay in accessing vehicles
b. Seasonal interruptions
c. Presence of potholes
d. Others (specify) ………………………………………………………………………

6. TRANSPORT SERVICES

Provision and Reliability of Transport Services

34. How easy is it to get vehicle in the wet and dry season to your destinations?

Season	Vehicle Access Situation						
	Always available	**Only on market days**	**Only on hiring basis**	**Very difficult to get**	**From nearby urban centers**	**From nearby rural centers**	**Others (specify)**
Wet							
Dry							

34. How long does it take you to get vehicle?…………………………………..

35. Is transport service in this community/settlement reliable?
   a) Yes [ ] b) No [ ] c) Cannot tell [ ]

35 (b) Explain your answer to (35) above: ……………………………………

36. Is the reliability of transport services related to the condition/nature of the road?
   a) Yes [ ] b) No [ ] c) Cannot tell [ ]

36. b. Explain your answer above:

……………………………………………………………………………………………

IMPACT OF ROAD CONDITION ON ECONOMIC ACTIVITIES

37. How has the improvement of the road impacted on the following:
   a) Location of activity …………………………………………………..
   b) Source of products ……………………………………………………
   c) Frequency of visits to market ………………………………………………….
   d) Choice of mode to market ……………………………………………………………
   e) Freight and passenger charges …………………………………………………
   f) Waiting time ……………………………………………………………………
   g) Travel time ……………………………………………………………………...
   h) Others (specify) ……………………………………………………………

Household Travel Patterns and Access to Social Facilities/ Amenities

38. How many motorized trips are made by your household per month?

Persons	Trips Made

39. Please indicate on the table below your household trip patterns.

Destination	Mode		Frequency of Trip/month	Transport Charge	Time Taken	Trip Purpose
	Motor	Non-Motor				

Travel Speed and Waiting Times

40. Are there any fixed times you can get a vehicle? Yes [ ] No [ ]

40b. If yes when Market Day [ ] Non-Market Day [ ]

41. How long does it take you to walk to the vehicle pick up point?…………………

42. How long does it take you to get vehicle at the main local lorry station?………… 43. How long does it take you to get vehicle at the roadside?…………………………

44. How reliable are the transport services along this road.

a) Very reliable (always available) [ ] b) not reliable (difficult to get) [ ]

c) Other(s) specify ……………………

Access and Mobility to Social Facilities **Education:**

45. Where do the children in your household attend school?

a) Within this community b) Outside this community (specify name)……………..

46. Indicate the level, location, distance and mode of transport to the educational facilities used by the children in their household.

Level	No. of children Attending	Location	Distance from Home to School	Mode of Transport to School	Frequency of Trip to School	Travel Time to School

KG						
Primary						
JSS						
SSS						

Health

47. Indicate the level, number, location, distance and level of access to the health facilities available to your household?

Type of Facility	**Number of facility**	**Location/Place**	**Status (Good, Fair, Bad)**	**Distance (km)**	**Mode of Transport**	**Travel Time to Facility**	**Transport Cost (1way)**
Hospital							
Health Centre							
Health Post							
Clinic							
Others (Specify)							

48. Do health professionals visit your household? Yes [ ] No [ ]

48b.If yes to the above, what do they discus with you?

a) Primary health care [ ] b) Reproductive health [ ] c) HIV/AIDS prevention [ ]
d) Others (Specify)……………………………………………..

49. How often do members of your household visit the health facilities in a month?……………

50. Does the current road condition make it easy for them to attend? Yes [ ] No [ ]

50b. Explain your answer above………………………………………………………………………

……

51. How do you rate your household access to the various health facilities?

Facility	**Rate of access to Health Facility**					**Reason**
	Very Good	**Good**	**Bad**	**Very Bad**	**Don"t Know**	
Health Centre						
Health Post						
Clinic						
Other Health Facilities (Specify)						

E. HOUSEHOLD INCOME AND EXPENDITURE PATTERNS

52. Please indicate your household income/sources on the table below:

Main sources of Income	Daily	Weekly	Monthly	Annually
Farming				
Trading/Commerce				
Industry				
Forestry/Production of Forestry Product				
Transport & Vehicle Operation				
Manufacturing/Construction				
Food Processing				
Remittances				
Renting				
Tourism Industry				
Others (Specify)				

53. Indicate how much your household spend on the following expenditure items on the table below.

Household Expenditure Items	Daily	Weekly	Monthly	Annually
Food				
Education				
Electricity				
Farm Inputs				
Rent				
Funeral/Social Functions				
Fuel (Kerosene, gas, etc.)				
Water				
Transportation				
Health				
Capital Items				
Business/Economic Activities				
Others (specify)				

Appendix 3.12: Focus Group Discussion (FGD)

1. What has been the impact of the road on economic activities in the community?
2. What has been the impact of the improved road on your travel patterns?
3. How has the improved road impacted on access to healthcare?
4. Where do women in this community give birth?
5. If within the community is it supervised by a skill attendant? Yes or No

6. If outside the community, state where and explain if it was supervised by a skilled attendant.
7. Impact on school children‘s access to education.
8. Impact of road on general access to input and output markets.
9. Has there been new facilities brought to the community after the improvement in the road? Yes or No. If yes, name them……………………………………….
10. What have been the challenges facing the community from the road improvements?
11. What are the suggestions for future road improvements?

Appendix 4.1: CPI Calculation

The first column shows the crop items and the second column shows the original prices of the crops in the old cedis and this converted to the new Ghana cedis in the third column. The last column are the prices obtained from the survey in 2014.

Using the Consumer Price Index (Cpi)

If we want to know how much the cost of the crops in 2005 will be in 2014 we need to do the following:

Step 1: We need the CPI of 2005 and the CPI of 2014.

Step 2: We need to know the prices of the various crops in 2005.

Step 3: To obtain the multiplier which will be used to adjust the 2005 prices to 2014; divide the CPI_{2014} by the CPI_{2005}.

Step 4: Multiply all the crop prices in 2005 by the outcome in ―Step 3‖ to obtain their current value in 2014.

CPI_{2005} = 52.9

CPI_{2014} = 136.4 (Note: The aggregate CPI for Ghana in 2014 was not found so that of the December market closing was used, hence this CPI is for December 2014)

136.4/52.9= **2.58**

<u>The Approach using December CPIs:</u>

December 2005 CPI = 47.2

December 2014 CPI = 136.4

So if 136.4/47.2 = **2.89**

Now 2.89 is used to multiply all the crop prices recorded in 2005 to adjust them to 2014.

	2005		2014	
Crop	Old cedi	GH cedi	Adjusted Prices in GH cedi	Survey prices in GH Cedi
Cocoa (bag)	560,000	56.00	161.84	214.00
Maize (bag)	120,000	12.00	34.68	102.00
Plantain (bunch)	15,000	1.50	4.34	7.18
Cassava (bag)	30,000	3.00	8.67	50.24
Cashew (bag)	400,000	40.00	115.6	122.00
Oil Palm	15,000	1.50	4.34	-
Yam (tuber)	5,000	0.50	1.45	-

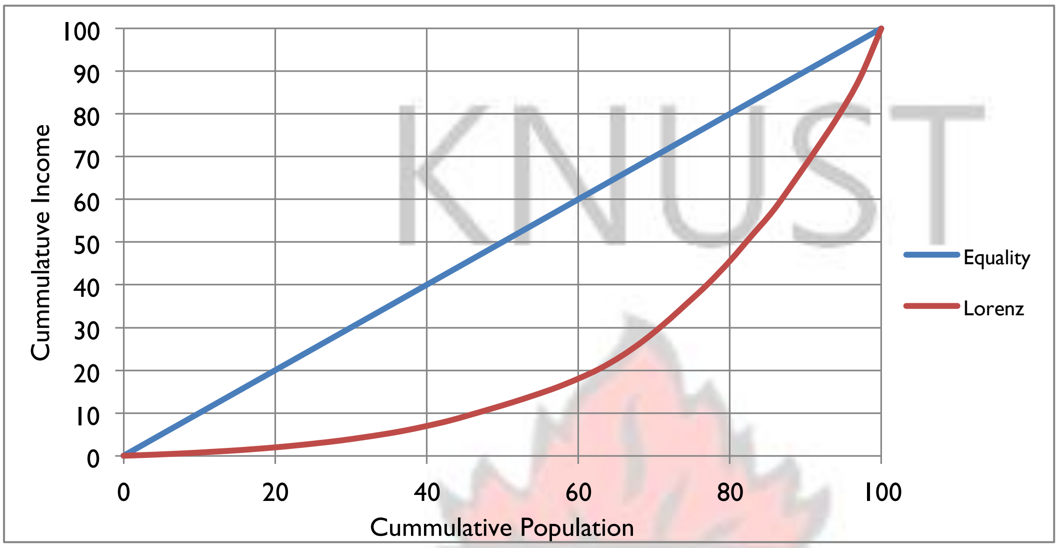
Beans (bag)	250, 000	25.00	72.25	-

Appendix 4.2: Health (Number of Health Facilities)

District	Corridor	Hospital	Health Center	Clinics
Wenchi	Awisa-Atuna	2	2	4
	Atuna-Nsuhunu			
Bekwai	Poano-Ntinako-Adoowa	6	1	7
	Aniantentem-Amanhyia-Odumase			
Jaman North	Old-Drobo-Ponko No. 1	1	1	14
	Kokosua No. 1& 2			
Sekyere South	Agona-Wiamoase	2	6	1
	Kokoteasua-Wiamoase			

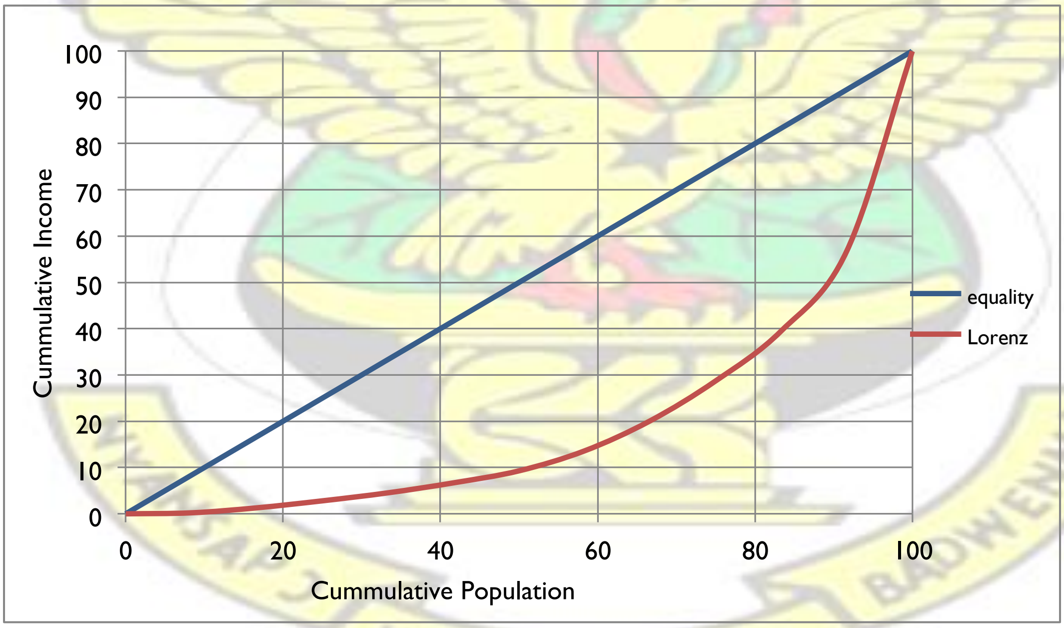
Appendix 4.3 Calculation Of Gini Coefficent

INTERVENTION



GINI Co-efficient= 1:0.48

CONTROL



GINI Co-efficient = 1:0.64

Appendix 4.4 :School children walking home from school (10km)

Appendix 4.5: School children walking home from school (10km)

Source: Field Survey, March 2014

Appendix 4.6 :Non-rickety taxi being used in place of rickety ones

Appendix 4.7: Women mending the Kokotesua –Wiamoase road

Source: Field Survey, March 2014

Appendix 5.1: Spearmen Rank Correlation to compare expenditure items on the study corridors

Variable	Control Rank	Intervention Rank	D	d^2
Food	11	11	0	0
Education	10	10	0	0
Electricity	1	0	1	1
Farm inputs	12	12	0	0
Rent	8	8	0	0
Funeral/social event	6	5	1	1
Fuel	4	3	1	1
Water	2	1	1	1
Transport	7	6	1	1
Health	5	4	1	1
Capital items	3	7	-4	16
Business activity	9	9	0	0
Food			$\sum d^2$ =	**22**

Source: Field Survey, March 2014

$$P = 1 - \frac{6\sum d^2}{N(N^2 - 1)}$$, where N = 12.

$$= 1 - \frac{6 * 22}{12} \quad = 1 - \frac{132}{1716} \quad = 1 - 0.077$$

P = 0.92