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Impact of roads on security and service delivery

Maham Farhat and Janet Hayes

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Abbreviations

ADB	Asian Development Bank
DFID	Department of International Development
FCAS	Fragile and Conflict Affected States
FGD	Focus Group Discussion
KII	Key Informant Interview
ODI	Overseas Development Institute
OPM	Oxford Policy Management
UN	United Nations

1 Overview

1.1 Objective

Two specific areas of interest are:

a) The security impacts of roads; and

b) The service delivery effects of roads (e.g. effects of road building on access to health and education services).

The objective of this query is to assess what the literature says about the relationship between roads and these two issues and to examine any evidence from previous road building/maintenance programmes in particular.

Particular attention will be paid towards any evidence from fragile and/or sparsely populated and ill-served rural areas.

1.2 Search methodology

A systematic search of available literature was conducted using online resources including the Google Scholar search engine; databases such as JSTOR, Wiley and Econlit; and websites of international development organisations such as the World Bank, UN, DFID and ADB, as well as other relevant resources like Eldis. The search was restricted to evidence from developing countries but was extended to include all types of roads.

A combination of the following search terms has been used to search the literature available online:

Access; conflict; developing; education; evaluation; feeder; fragile; health; impact; infrastructure; peace building; program(me); roads; rural; security; socioeconomic; service delivery; transport

1.3 Summary of findings

We provide below a brief summary of the key findings relating to the security impacts of roads and the service delivery effects of roads. More detailed findings of each paper reviewed are provided in the annotated bibliography following this summary.

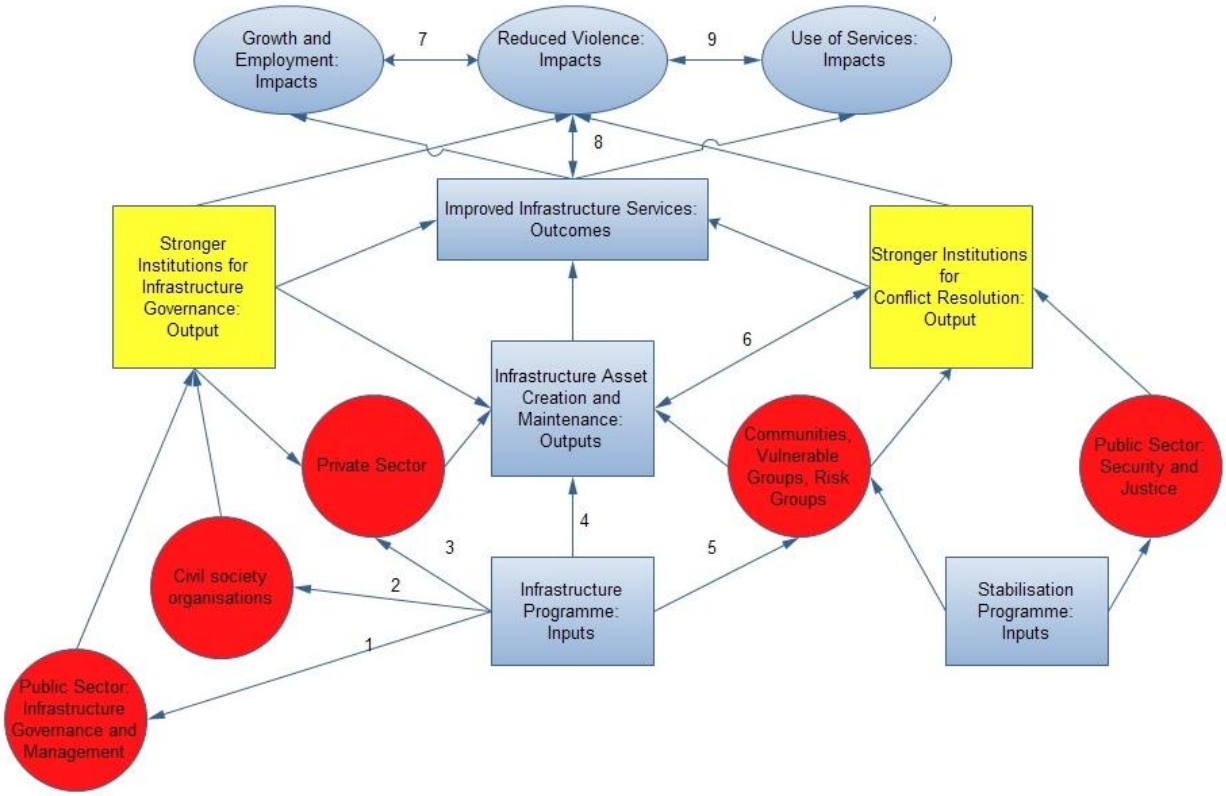
Security impact

No direct evidence relating to the security impact of road infrastructure was found in the literature. Theoretical linkages of infrastructure development, including transport infrastructure are discussed in several studies. There are various direct and indirect channels through which transport infrastructure may affect security and peace building:

“Infrastructure programmes can potentially play three main types of role in a fragile context: as an engine of economic recovery and improved service provision, as part of a process of strengthening institutions, and in stabilisation and peace-building. The Figure below identifies causal relationships that are of potential significance for understanding how an infrastructure

programme might achieve impact in a fragile or conflict-affected context."(Jones and Howarth, 2012)

Figure 1.1 Infrastructure impact in Fragile and Conflict Affected States (FCAS)



Source: Jones and Howarth, 2012

As Jones and Howarth (2012) state, the state of evidence regarding these causal links is weak. However some aspects of infrastructure development - including, but not exclusive to, road construction - such as community-driven development, have been shown to be effective in fragile country contexts. Other investments such as Quick Impact Projects (QIPs)[1] have not yet proven to be effective in enhancing peace building and security in Fragile and Conflict Affected States[2] (FCAS).

The literature search for this query did present some evidence of road development resulting in employment generation, sometimes for the most vulnerable and/or poor groups in the community. For instance a rural road improvement programme in the Philippines has benefited traditionally marginalised and isolated communities, and linked them to key markets and employment centres (pp. 25, ADB, 2009). Case studies, presented in Jones & Howarth (2012), on the Rural Access Programme in Nepal and Roads in the East Programme in the Democratic

[1] Quick Impact Projects (QIPs) are small-scale, low-cost projects that are planned and implemented within a short timeframe.

[2] The World Bank's World Development Report (pp. xvi, 2011) describes fragility as "Periods when states or institutions lack the capacity, accountability, or legitimacy to mediate relations between citizen groups and between citizens and the state, making them vulnerable to violence".

Republic of Congo (DRC) also show that road development programmes can produce short-term employment opportunities in fragile and conflict affected regions. This particularly applies to programmes where rural road development is carried out through community-driven development or with special emphasis on inclusion through participatory methods (see World Bank, 2006). However the evidence base on employment effects is mostly limited to number of hours of employment generated/individuals employed and include little rigorous impact evaluation. There was also some evidence that rural road construction reduced isolation for minority groups; and provided more opportunities for inclusion in wider economic activity. ADB (2009) reports that rural road development projects in Nepal have reduced geographical isolation for rural people in the mid-hills of Nepal who are now able to interact and integrate with wider society. However, as stated above this evidence did not relate directly to reducing conflict or improving security.

Service delivery

The literature on poverty and isolation defines three channels through which road access contributes to reduce poverty: access to inputs and output markets, access to education and health services and access to labour opportunities.

The literature search did reveal evidence, mostly qualitative; suggesting that rural road construction or maintenance has a positive impact on service delivery. In general rural road development leads to improved access of both users and suppliers. This occurs due to a reduction in commuting time, as well transport costs (in areas where transport provision is competitive). However these benefits tend to accrue disproportionately to influential and well-educated groups. Nevertheless rural communities tend to ascribe great importance to road development and perceive it to improve access to markets, health and education facilities.

An annotated bibliography presenting relevant literature is provided below. It distinguishes literature which presents evidence on security impact or service delivery impact. Studies not directly relevant but addressing other important themes in the literature i.e. the impact of infrastructure on gender and the effect of rural road access on poverty are also presented. Additionally a list of references in alphabetical order is presented at the end of this document.

2 Annotated Bibliography

Source	Abstract & Key Findings	Security Impact of Roads?	Service Delivery Impact of Roads?
Infrastructure, security and service delivery			
ADB, 2006. When do rural roads benefit the poor and how? An in depth analysis based on case studies. Asian Development Bank. http://ti-up.dfid.gov.uk/uploads/public/documents/Key%20Documents/rural-roads.pdf	This study presents empirical evidence from a cluster of case studies drawn from past ADB operations (in rural road construction) in Sri Lanka, Indonesia and Philippines. It is primarily intended to address two questions: (i) How do rural roads help reduce poverty? And (ii) How can rural road projects be designed to help reduce poverty more? The study uses both secondary quantitative data and primary qualitative data. There is some evidence which suggests that construction of rural roads improves access to health facilities and schools; and also improves the mobility of teachers, health workers, and extension workers, allowing them to provide services to the remote villages. This also enables provincial health, education, and agriculture officials to monitor the quality of service delivery in a more time-efficient way.	No	Yes
ADB, 2009. Asian Development Bank's Contribution to Inclusive Development through Assistance for Rural Roads (Special Evaluation Study). Independent Evaluation Department, Asian Development Bank. http://www.adb.org/sites/default/files/SST-REG-2009-35.pdf	This study attempts to address four specific questions: (i) what are the key economic, environmental, institutional, and social that resulted from rural roads? (ii) what are the key constraints to Inclusive Development (ID) through rural roads? (iii) how sustainable are the mechanisms for the operation and maintenance of rural roads (iv) what supporting measures and policies are needed to fully capture the ID potential of rural roads project. The study explores performance of a sample of rural roads portfolio of ADB during the 1996-2007. The methodology comprises both desk research and field study. The field survey covered 173 FGDs, 33 value chain analysis, and 136 KIIs in the six sample projects in three case study countries (Nepal, Philippines and Viet Nam)	Maybe	Yes

	It presents evidence to suggest that rural road development (in this case, mostly development of pre-existing roads) improves access to health facilities, particularly to the vulnerable populations; and also improves access to schools. It does lead to a change in enrolment. Locals' concerns on the negative social impact of rural road development (such as development of bars, prostitution outlets, road accidents) are also documented. Improved roads however do lead to more frequent travel by staff from service delivery institutions and NGOs, subject to travel budgets. There is no direct evidence linking rural road development to reducing social tension or improving security but greater social interaction between ethnicities and reduced isolation of minorities is documented in the case study countries.		
ADB, 2009. Socio-Economic Impact Assessment Report Rural Roads Project-1 Chhattisgarh. Asian Development Bank. http://pmgsy.nic.in/downloads/ARCG.pdf	The project relates to a multi-year program to document and analyse the socio-economic impacts of the construction/ improvement of about 5500 Km of village and Other District Roads (ODR) in Chhattisgarh state through ADB funding of Rural Roads Project No. 1.This report presents the assessment of the socio-economic impact using the data collected as a result of the quantitative surveys, FGDs and KIIs conducted in 2008. It presents evidence which suggests that the project led to an improvement in health and education service delivery in the project areas: "Health Services: The reasons for rise in the safe deliveries; and, reduction in the maternal / pre-natal deaths are a) partly attributable to the project roads and b) partly to the increased emphasis on the counselling undertaken by the health worker in the village." "Education: Project roads have encouraged teachers' attendance as well as the school inspections. This has largely improved the academic performance of the students."	No	Yes

AfDB, 1999. Botswana Rural Roads II Project: Project Performance Evaluation Report (PPER) (Project Evaluation). African Development Bank. http://www.afdb.org/fileadmin/uploads/afdb/Documents/Evaluation-Reports/05244230-EN-BOTSWANA-RURAL-ROADS-II-PROJECT.PDF	Project evaluation report. Does not present systematic evidence of project impact but states that the project improved access to health and education facilities.	No	Yes
AfDB, 1999. Zimbabwe Rural Roads I: Project Performance Evaluation Report (PPER) (Project Evaluation). African Development Bank. http://www.afdb.org/fileadmin/uploads/afdb/Documents/Evaluation-Reports/05182254-EN-ZIMBABWE-RURAL-ROADS-I-PROJECT.PDF	Project evaluation report. Does not present systematic evidence of project impact but states that the project improved access to health and education facilities.	No	Yes
Bell, C., 2012. Estimating the Social Profitability of India's Rural Roads Program: A Bumpy Ride. World Bank Policy Research Working Paper 6168. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2129610	This paper analyses India's rural roads program, Pradhan Mantri Gram Sadak Yojana, which aims to draw villagers into the mainstream by improving not only their terms of trade, but also their educational attainments and health. Treating each all-weather feeder road as an isolated element within the larger network, and using shadow prices to value the main components of costs and benefits, the paper demonstrates that further investments in the program are, with high probability, socially profitable, especially in poorer and more densely settled regions.	No	Yes

	Taking the entire set of new individual roads together, qualitative arguments suggest that their external and spill-over effects on the system as a whole probably generate some net additional benefits, but of very uncertain magnitude The formal estimates of the benefits generated in the spheres of education and health are substantial in size, though the method used to arrive at them has its weaknesses. Qualitative evidence also suggests that respondents rank these benefits roughly on a par with the commercial ones.		
Bird, K., McKay, A., Shinyekwa, I., 2010. Isolation and poverty: the relationship between spatially differentiated access to goods and services and poverty. ODI Working Paper 322. http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/5516.pdf	This paper uses available quantitative data to develop composite indices of isolation for Uganda based on a series of indicators of access to infrastructure (including access to roads) and services, and uses these to examine the relationship between isolation and different aspects of poverty. Data from the 1999/00 Uganda National Household Survey (UNHS) are used to examine the relationship between these measures of isolation and different dimensions of poverty, including measures of vulnerability. The paper presents qualitative evidence directly linking lack of access to roads to isolation and poverty. The statistical analysis also confirms the positive relationship between poverty and isolation indices (of which access to roads is one composite indicator)	No	Yes
Bryceson, D.F., Bradbury, A., Bradbury, T., 2008. Roads to Poverty Reduction Exploring Rural Roads' Impact on Mobility in Africa and Asia. Development Policy Review 26, 459–482.	Using rapid village survey data from Ethiopia, Zambia and Vietnam, this article explores if rural road infrastructure is effective in addressing mobility and social-service accessibility in rural areas. The findings indicate that, in extremely remote areas, road improvements may catalyse the expansion of social-service provision, as evidenced in Ethiopia. However, given the poor's relative lack of motor vehicles and ability to pay for public transport, they are, by no means, a sufficient condition for enhancing the mobility of	No	Maybe

http://onlinelibrary.wiley.com/doi/10.1111/j.1467-7679.2008.00418.x/abstract	the rural poor. There is no direct evidence on the impact of rural roads on service delivery or security. However the findings are relevant in understanding how rural roads may prove to be effective.		
Escobal, J., Ponce, C., 2002. The benefits of rural roads: Enhancing income opportunities for the rural poor. Documento de trabajo. http://grade.org.pe/download/pubs/ddt/ddt40EN.pdf	This paper evaluates the impact of rural roads on key welfare indicators such as income or consumption in rural households living in some of the poorest districts of Peru. It compares (using propensity score matching techniques) households located near rehabilitated roads to suitable controls. Results show that rehabilitated road accessibility can be related to changes in income sources, as the rehabilitated road enhances non-agricultural income opportunities, especially from wage employment sources. The study also finds that income expansion is not been matched by an equivalent consumption increase; apparently because the additional income is allocated to savings, through increments in livestock, most likely because road quality improvement is being perceived as transitory. There is no direct evidence on the impact of rural roads on security or service delivery.	No	No
Danida, 2010. Impact Evaluation of Danida Support to Rural Transport Infrastructure in Nicaragua. Ministry of Foreign Affairs of Denmark, Copenhagen. http://um.dk/en/~/media/UM/English-site/Documents/Danida/Eval/978-87-7087-369-7/20073EvaluationStudysomtrykt.ashx	The purpose of the impact evaluation was to contribute to the justification, design and implementation of future rural transport infrastructure programs in Nicaragua. The objective was to assess the impact on the beneficiaries' socio-economic situation and physical well-being, of the rural transport infrastructure interventions supported by Danida under PAST's (Transport Sector Support Program) Component Two. The evaluation covered interventions from 1999-2004 and completed interventions under the current phase. Where relevant, interventions initiated prior to 1999 have been included. Impacts have been addressed at household and at community level. The evaluation uses both quantitative survey data and qualitative data gathered from FGDs and KIIs. In the area of social impacts, qualitative	No	Yes

	evaluation methods indicate that communities that have participated in PAST have improved their access to services in health and education services and have more frequent and reliable contact with both than comparable communities that have not participated in the program (see pp. 66-66 for detail). One very important result has been an improved and more secure access to emergency transport services by community members. In terms of women empowerment, it was found that women's economic and social participation has improved due to PAST interventions, at least in the Las Segovias region.		
IDS, 2006. Transport, the missing link? A catalyst for achieving the MDGs (No. 63), id21 insights. Institute of Development Studies. http://www.eldis.org/id21ext/insights63editorial.html	In this issue of id21 insights, each article builds a picture of transport's catalytic role in creating greater access to employment opportunities, educational and health facilities, agricultural development, social inclusion and networking. The introduction presents the 'theory of change' behind rural access and mobility and achieving the MDGs. A summary of relevant evidence and further links to research is then presented at the end of each article. Gina Porter's article (pp.3) demonstrates how getting to school in rural areas costs time, energy and money– preventing children, particularly girls, and staff from attending. Taye Berhanu's work (pp.4) in Ethiopia on the safe transportation of expectant mothers and a new research programme on Mobility and Health shows that health services aiming to reduce maternal and child mortality would benefit from the safe, timely and appropriate transport of patients, health personnel and medicines.	No	Yes
Jones & Howarth, 2012. Supporting Infrastructure Development in Fragile and Conflict-Affected States: Learning from Experience http://www.opml.co.uk/projects/infrastruct	This study examines the available evidence on the experience of international support to improving infrastructure in fragile and conflict-affected contexts. It draws on a literature review and case studies. Case studies focusing on road construction as a part of the DFID supported infrastructure programmes are Afghanistan, Democratic Republic of Congo, Nepal This study identifies the main causal relationships by which infrastructure programmes	Yes	No

ure-fragile-and-conflict-affected-states	*may* contribute to economic growth, poverty reduction and improved access to services, as well as their relationship to processes of stabilisation, peace building and state-building. Although the evidence base is in many areas weak, some clear conclusions emerge about the strengths and weaknesses of past engagement, and lessons for the design and implementation of more effective infrastructure programmes Case studies and an annotated bibliography focussing on evidence of infrastructure impact in FCAS are presented separately		
Khandker, S.R., Bakht, Z., Koolwal, G.B., 2009. The Poverty Impact of Rural Roads: Evidence from Bangladesh. Economic Development and Cultural Change 57, 685–722. http://www.jstor.org/stable/10.1086/598765	This study uses household-level panel data collected by BIDS with reference to two projects—the Rural Development Project (RDP) and the Rural Roads and Markets Improvement and Maintenance Project (RRMIMP)—supported by the World Bank. A household fixed-effects technique is used to estimate the returns to road investment in terms of its impact on household per capita consumption, male and female labour outcomes across agricultural and non-agricultural sectors as well as wage and nonwage opportunities, primary and secondary school participation rates of boys and girls, aggregate crop output and price indices, fertilizer prices, and household transport expenses. Findings from the paper indicate that secondary school enrolment of boys and girls increased significantly in both project samples, whereas primary school enrolment was not affected to the same degree	No	Yes
Kingombe, C., 2011. Achieving pro-poor growth through investment in rural feeder roads: the role of impact evaluation. Background Note. London: ODI. http://www.odi.org.uk/resources/docs/7135.pdf	This Background Note provides suggestions on what state-of-the-art Aid for Trade (AfT) impact evaluations could look like, and why they should be part of a project's design from the outset in order to improve policy conducive to achieving the MDGs. It focuses on AfT interventions categorised as either labour-based or equipment-based rural transport infrastructure (RTI). It explains methodological issues with impact evaluation of rural roads programs and presents a summary of key impact evaluation studies (sorted by author, country covered, data source,	No	Yes

	method and key findings)		
Koolwal, G.B., Khandker, S.R., 2011. Estimating the Long-term Impacts of Rural Roads: A Dynamic Panel Approach. https://openknowledge.worldbank.org/handle/10986/3633	This paper uses panel data collected by the Bangladesh Institute of Development Studies (BIDS) of project and control households under the Rural Roads and Markets Improvement and Maintenance Project (RRMIMP); spanning three rounds (pre-program and post-program) between 1997 and 2005. It estimates the short-term and long term effects of rural roads over eight years. A dynamic panel model, estimated by generalized method of moments, is applied to estimate the varying returns to public road investment accounting for time-varying unobserved characteristics. The results show that the substantial effects of roads on such outcomes as per capita expenditure, schooling, and prices as observed in the short run attenuate over time. But the declining returns are not common for all outcomes of interest or all households.	No	Yes
Levy, H., 2004. Rural Roads and Poverty Alleviation in Morocco, in: Reducing Poverty, Sustaining Growth: What Works, What Doesn't, and Why A Global Exchange for Scaling Up Success. Presented at the Scaling Up Poverty Reduction: A Global Learning Process and Conference, The World Bank, Shanghai. http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2004/12/07/000090341_20041207103309/Rendered/PDF/308170MOR0Rural0Roads01see0also0307591.pdf	The study assesses the impact of paving and other improvements (completed between 1987 and 1991) to four rural roads in three regions of Morocco: Northern (Chefchaouen), Central (Settat) and Southern (Marrakech). The study draws on survey data and FGDs Key findings on health and education impact: • enrolment in primary education doubled over a 10-year period, substantially more than in the control areas; similarly, there was a significant increase in visits to primary health care facilities and clinics • the quality of education and health services improved, as improved accessibility made it possible to recruit teachers and medical staff enrolment of girls in primary education increased significantly more than that for boys • women gained the most in the increased number of visits to health services Note: this refers to the same study cited below (World Bank, 1996)		

Lombard, P., Coetzer, L., 2006. The Estimation of the Impact of Rural Road Investments on Socio-economic Development. http://ti-up.dfid.gov.uk/uploads/public/documents/Key%20Documents/Estimating%20the%20Impact%20of%20Road%20Inv%20on%20SocioEcon%20Development.pdf	This paper firstly provides a brief introduction to the relationship between poverty alleviation, road investment and economic growth in general, road investment in Africa and constraints of inadequate road investment. Secondly, the paper focus on the typical available methods used for the estimation of the impact of rural road investment on socioeconomic development as well as the benefits of rural road investments, through a brief review of some case studies in this regard. The paper lastly reaches conclusions with respect to the impact of rural road investments on socio-economic development. There is limited reference to the impact of roads on health and education service delivery.	No	Yes
Lyngby, K., 2008. General study rural roads impact Nicaragua. OECD. http://www.oecd.org/countries/nicaragua/42214904.pdf	The study presents the results of a multivariate regression analysis to examine to what degree rural roads influence a number of socio-economic factors in Nicaragua. The study draws exclusively on national household data, which contain general survey information about the state of rural roads in Nicaragua. Accordingly, the study examines how perceived changes in the rural road situation impact the lives of the rural population in Nicaragua. The study focuses on the period 1998-2005 for which comparable survey data are available. Rural roads appear to have an impact on especially health outcomes: The pooled regression analysis has considered impact on literacy and the tendency of the households to report sick. In both cases rural roads access appears to have an impact. The result for health outcomes is also supported by the fixed effects analysis, while no clear result was returned for literacy	No	Yes
Mott MacDonald, 2005. Provision of Infrastructure in Post Conflict Situations http://www.ti-up.org/uploads/public	Covers literature on infrastructure dating till mid-2000s. Aims to address needs in the DFID Competency Framework covering infrastructure. The paper covers water and sanitation, transport, shelter, communications and energy infrastructure sectors, as well as the reinstatement of public buildings. It includes brief examples from both conflict and post-conflict	Yes	No

/documents/Key%20Documents/Infrastructure%20in%20Post%20Conflict.pdf	countries, with some brief case examples of the role of transport infrastructure in peace building and project implantation issues in FCAS.		
USAID, 2008. Liberia Community Infrastructure Program I Report http://pdf.usaid.gov/pdf_docs/PDACM103.pdf	Summary of the USAID program, including summary of DFID involvement in infrastructure programmes with particular reference to peace building through community driven development approaches. This is primarily a project evaluation report which presents lessons on implementation of infrastructure projects in a fragile context. The limited evidence on impact and lessons learnt are mainly- though not exclusively- linked to road construction.	Yes	Yes
USAID, 2011. Afghanistan Infrastructure and Rehabilitation Program: Keshim-Faizabad Road Socio-Economic Post Project Final Report. USAID. https://www.irp-af.com/?pname=open&id=424&type=html&c=5	The Keshim-Faizabad Road in Badakhshan Province connects the communities of Keshim, a district centre, and Faizabad, the provincial capital. This report presents findings based on a pre-post evaluation design using both quantitative survey data and qualitative data. Indicators of interest include - Travel time to health clinic: uncertain outcome - Frequency of travel to health clinic: 12% more people are making trips to health facilities - Rates of school attendance: uncertain Also "The Keshim hospital director reported a dramatically increased patient load – a two-fold increase – because of the improved road." There is no evidence on the impact of road construction on security or peace building in the report. Note that methodology issues with these indicators are summarised on pp. 73. It appears that there are problems with sampling, data quality as well as instrument design.	No	Yes
Valdivia, M., 2010. Contracting the Road to Development: Early Impacts of a Rural Roads Program (Working Papers PMMA No. 2010-18).	This paper assesses the early impacts of the Peruvian rural roads program (RRP). RRP is characterised by the contracting of private local firms for the rehabilitation and maintenance of rural roads with local supervision by community leaders setting incentives that favour prevention activities and a sustainable and timely	No	Yes

PEP-PMMA. http://ideas.repec.org/p/lvl/pmmacr/2010-18.html	maintenance of rural roads. The analysis is based on a quasi-experimental approach through which control roads are defined prior to the intervention based on key observable characteristics of the road and the villages they connect. Difference-in-difference analysis is used. Findings indicate that this institutional innovation improved road transitability which in turn led to significant changes in employment patterns, increased investments in education and health, but not to higher household labour income. Differences by road type show that motorised roads (MRs) and non-motorised tracks (NMTs) play different roles in connecting individuals to key places such as farm fields, markets, schools and health centres. In particular, NMTs seem to help individuals travel between family houses and farms, helping women increase their participation in farm activities. Also, positive schooling effects focus on MRs, but the exclusion of older girls from them urges for a deeper understanding of the factors behind this source of gender inequities.		
Van de Walle, D., 2009. Impact evaluation of rural road projects. Journal of Development Effectiveness 1, 15–36. http://www.tandfonline.com/doi/abs/10.1080/19439340902727701	This paper surveys the problems and discusses some practical implementation issues related specifically to conducting an impact evaluation of a rural roads project that is assigned to some geographic areas but not to others. The paper evaluates a rural roads rehabilitation project in 18 provinces of Vietnam, 1997-2001. It uses panel data of 200 communes & 3000 households in project & non-project areas, with a (pre-intervention) 1997 baseline & post-project follow-up rounds in 2001 & 2003 allow a rigorous test of impacts & their heterogeneity. A diff-in-diff approach is used to assess project impacts. Significant impacts are found on goods & services availability, markets & market frequency, off-farm employment, primary school completion rates. Distance to central markets, low population density, high minority populations, high adult illiteracy & location in the North all consistently dampen road impacts.	No	Yes

Worku, 2011. Road Sector Development and Economic Growth in Ethiopia http://www.edri.org.et/Documents/EDRI_WP004_RoadSector.pdf	The study uses descriptive and econometric analyses to analyse trends, and impacts of road network on economic growth in Ethiopia. It finds that the stock of road network is by now growing at an encouraging pace but donor investment is lacking. Management and accountancy of community roads is weak. The econometric analysis reveals that total road network has significant growth-spurring impact. When the network is disaggregated, asphalt road also has a positive sectoral impact, but gravel roads fail to significantly affect both overall and sectoral GDP growth, including agricultural GDP.	No	No
World Bank, 1996. Morocco - Socioeconomic Influence of Rural Roads: Fourth Highway Project http://lnweb90.worldbank.org/oed/oeddoclib.nsf/24cc3bb1f94ae11c85256808006a0046/7bec60ee0d81629f852567f5005d3597	This study assesses the impact of paving and other improvements (completed between 1987 and 1991) to four rural roads located in three different regions of Morocco: North, Center and South. It in assesses (i) direct impact on transport infrastructure and services; (ii) impact on the agricultural economy; (iii) impact on the social sectors such as health and education; and (iv) impact on the environment. The study draws on survey data and FGDs The study shows that gains in school enrolment were much higher in treatment areas compared to control areas. In parallel, the quality of education improved, as it became possible to recruit teachers to staff the schools, and absenteeism of both teachers and students dropped. The rural population also nearly doubled their use of health care facilities (hospital and primary care), and, the quality of health services was enhanced as the supply of medicines improved, health officials launched a campaign to staff rural health care centres with a doctor, and immunization and other health prevention programs became easier to implement.	No	Yes
World Bank, 2002. Transport, in: A Sourcebook for Poverty Reduction Strategies: Macroeconomic and	This chapter highlights how integral transport is to any effective poverty-reducing strategy. Its objective is to help decision makers integrate transport interventions into poverty reduction programs. The chapter addresses two key questions: first, how can the transport sector	No	Yes

Sectoral Approaches. The World Bank, Washington, D.C. http://siteresources.worldbank.org/INTPRS1/Resources/383606-1205334112622/4408_chap22.pdf	contribute more effectively to poverty reduction: and second, what roles do various actors play in this effort? Our knowledge of the relationship between transport and poverty reduction is still evolving. This chapter seeks to reflect what we know now. Key document of interest is Annex R. Some evidence in the Morocco case study regarding the positive impact of road infrastructure on health and education. Other case studies demonstrate the impact on gender relations, time use, transportation costs, and local economy		
World Bank, 2006. Community-Driven Development in the Context of Conflict-Affected Countries: Challenges and Opportunities http://siteresources.worldbank.org/INTCDD/Resources/CDD_and_Conflict.pdf	This study draws on 13 case studies of conflict-affected countries that specifically have incorporated CDD initiatives in their development effort. It distinguished between on-going and post conflict scenarios. Through semi-structured interviews with the managers of these CDD programs, the report analyses the impact of CDD as a development option. It also extends current knowledge of the application of CDD approaches in conflict-affected environments by identifying common challenges and opportunities, drawing lessons learned from these operations, and disseminating the findings among donors and client governments Useful case studies (including road infrastructure investment) on Kosovo, Tajikistan & Angola. Project details of all the case studies are summarised on pg 37. These can provide examples on how to engage local communities in infrastructure programs in FCAS possibly contributing to peace building. However there is no direct evidence related specifically to road construction and peace building	Yes	No
Infrastructure and Gender Issues			
Source	**Abstract & Key Findings**	**Security Impact of Roads?**	**Service Delivery Impact of Roads?**
Agénor, P.R., Agénor, M., 2009. Infrastructure,	This paper develops a gender-based OLG model of endogenous growth to analyse the impact of infrastructure on women's time allocation	No	No

women's time allocation, and economic development. Centre for Growth and Business Cycle Research Discussion Paper Series. http://www.socialsciences.manchester.ac.uk/cgbcr/dpcgbcr/dpcgbcr116.pdf	between market work, raising children, own health care, home production, and leisure. An increase in productive government spending may shift the economy to a high growth equilibrium, in a process involving changes in life expectancy, fertility, and a reallocation of women's time. Note that this model is not limited to road/transport infrastructure.		
Bravo, A., 2002. The Impact of Improved Rural Roads on Gender Relations in Peru. Mountain Research and Development 22, 221–224. http://www.bioone.org/doi/abs/10.1659/0276-4741(2002)022%5B0221:TIOIRR%5D2.0.CO%3B2	This paper presents the impact of improved rural roads on gender relations in the Peruvian Andes, with a focus on the example of the Rural Roads Program. Recommendations are made for more gender-sensitive policy programs in the transport sector. The findings suggest that the rural roads program has reduced the time taken for women to access health care but no impact on use was detected as unaffordable prices of medicine discouraged women from using these services. The gap between young men and women in enrolment in secondary education was reduced (although not strikingly), especially in rural areas. Improved roads made it easier and faster to reach school. However the paper does not explain the methodology or data sources for these findings.	No	Yes
Chowdhury, S.K., 2010. Impact of infrastructures on paid work opportunities and unpaid work burdens on rural women in Bangladesh. Journal of International Development 22, 997–1017. http://onlinelibrary.wiley.com/doi/10.1002/jid.1607/abstract	This study deals with two questions: what role rural infrastructure can play in promoting paid work opportunities for women and what specific type of infrastructure can reduce women's time burden? The study brings empirical evidence on these two questions in the specific country context of rural Bangladesh. Findings from an econometric model that endogenises women's paid and unpaid work show that the impacts of infrastructure on women's work and total time burden depend on the type of a particular infrastructure and availability of other infrastructures. While hard infrastructure shows significant influence on women's work with a lag, a rise in paid work outside home has not been equally compensated by a decline in unpaid work	No	No

	at home. Three types of public (hard) infrastructure are considered in this study are: paved roads, telephony and electricity		
Infrastructure, Income and Productivity			
Source	**Abstract & Key Findings**	**Security Impact of Roads?**	**Service Delivery Impact of Roads?**
Cuong, N.V., 2011. Estimation of the impact of rural roads on household welfare in Viet Nam. Asia-Pacific Development Journal 18, 105–135. http://www.unescap.org/pdd/publications/apdj-18-2/apdj-18-2-fulltext.pdf#page=110	This paper measures the effect of rural roads on the welfare of households in Viet Nam. The findings show that rural roads help households increase per capita income and working hours. The estimated impact of these roads on expenditure, the share of non-farm income, and children's schooling rate is not statistically significant. Unlike Van de Walle and Cratty (2002) and Mu and Van de Walle (2007), who measured the effect of specific road projects, this paper examines the effect of roads in rural Viet Nam using nationally representative data from Viet Nam Household Living Standard Surveys (VHLSSs) of 2004 and 2006.	No	No
Gachassin, M., Najman, B., Raballand, G., 2010. The Impact of Roads on Poverty Reduction: A Case Study of Cameroon. SSRN eLibrary. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1559726	Using the second Cameroonian national household survey (Enquête Camerounaise Auprès des Ménages II, 2001) and the Cameroon case study, this paper demonstrates that investing uniformly in tarred roads in Africa is likely to have a much lower impact on poverty than expected. Isolation from a tarred road is found to have no direct impact on consumption expenditures in Cameroon. The only impact is an indirect one in the access to labour activities.	No	No
Gibson, J., Rozelle, S., 2003. Poverty and Access to Roads in Papua New Guinea. Economic Development and	This paper assesses the impact of access to roads in rural areas on poverty in Papua New Guinea (PNG). Data comes from the 1996 PNG household survey. Findings indicate that access to roads has an independent effect on reducing poverty.	No	No

Cultural Change 52, 159–185. http://www.jstor.org/stable/10.1086/380424			
Hine, J.L., Riverson, J., 2001. The impact of feeder road investment on accessibility and agricultural development in Ghana. The World Bank. http://www4.worldbank.org/afr/ssatp/Resources/HTML/rural_transport/knowledge_base/English/Module%201%5C1_2b%20Case%20Study%20-%20Poverty%20Alleviation.pdf	The study was carried out in the period 1978-1982 and its purpose was to determine how parameters of rural development (particularly agricultural practises, costs and prices) varied with accessibility in the Ashanti Region of Ghana. Survey data from 492 holders in 33 villages revealed little evidence which suggested that agriculture was adversely affected by inaccessibility, apart from some difficulty in obtaining loan finance in the more remote areas. The more accessible villages were observed to have a higher proportion of people employed outside agriculture. The improvement of existing road surfaces was estimated to have a negligible impact on prices paid to the farmer. However, connecting a village to a road head by converting a footpath to a vehicle track was calculated to have a gross beneficial effect in the order of a hundred times greater than improving the same distance of earth track to good gravel road.	No	No
Jacoby, H.G., 2000. Access to Markets and the Benefits of Rural Roads. The Economic Journal 110, 713–737.	This paper develops a method for estimating household-level benefits from road projects using the relationship between the value of farmland and its distance to agricultural markets. The empirical analysis, using data from Nepal, suggests that providing extensive road access to markets would confer substantial benefits on average, much of these going to poor households. However, the benefits would not be large enough or targeted efficiently enough to appreciably reduce income inequality in the population.	No	No
Jacoby, H.G., Minten, B., 2009. On measuring the benefits of lower transport costs. Journal of Development Economics 89, 28–38.	This paper derives an expression for the willingness-to pay for a reduction in transport costs from the canonical agricultural household model and uses it to estimate the benefits of a hypothetical road project. Estimation is based on novel cross-sectional data collected in a small region of Madagascar with enormous, yet plausibly exogenous, variation in transport cost. A road that essentially eliminated transport costs in	No	No

	the study area would boost the incomes of the remotest households— those facing transport costs of about $75/ton—by nearly half, mostly by raising non-farm earnings. This benefit estimate is contrasted to one based on a hedonic approach.		
Kingombe, C., Di Falco, S., 2012. The Impact of a Feeder Road Project on Cash Crop Production in Zambia's Eastern Province between 1997 and 2002 (IHEID Working Paper No. 04-2012). Economics Section, The Graduate Institute of International Studies. http://econpapers.repec.org/paper/giigiihei/heidwp04-2012.htm	The objective of our paper is to quantify the direct and indirect rural transport infrastructure investment impacts of the Eastern Province Feeder Road Project (EPFRP). It uses repeated cross section data from the Zambian Post-Harvey Surveys (PHS). No evidence is presented on the health or education impact of the project.	No	No
Rand, J., 2011. Evaluating the employment-generating impact of rural roads in Nicaragua. Journal of Development Effectiveness 3, 28–43. http://www.tandfonline.com/doi/abs/10.1080/19439342.2010.545890	This paper analyses the employment-generating impact of a tertiary road project in Nicaragua, applying a matched double-difference approach to control for initial conditions and time variant factors that simultaneously influence the placement of roads and subsequent employment growth rates. The author's estimates indicate an increase in hours worked per week attributable to the intervention of around 9.5–12.3 hours. Moreover, he observes tendencies of a graduation process taking place in the labour market: individuals moving out of unemployment predominately achieve employment in the agricultural sector (self-employment), whereas newly created service sector jobs primarily are taken by workers previously working in agriculture. Finally, the analysis suggests that the employment-generating effect comes through a combination of reduced travel time and better access to markets and larger, more integrated road networks.	No	No

Ulimwengu, J.M., Funes, J., Headey, D.D., You, L., 2009. Paving the Way for Development: The Impact of Road Infrastructure on Agricultural Production and Household Wealth in the Democratic Republic of Congo (2009 Annual Meeting, July 26-28, 2009, Milwaukee, Wisconsin No. 49292). Agricultural and Applied Economics Association. http://ideas.repec.org/p/ags/aaea09/49292.html	The paper employs GIS-based data to assess the impact of market access on agricultural and rural development (ARD). The DRC road network data is augmented with survey-based data from Minten and Kyle (1999) on agricultural transport times to calculate improved "market access" measures for the DRC. The long run relationship between market access and agricultural production and household wealth is also investigated. The paper presents simulations of how proposed infrastructure investments would affect market access, and how market access would in turn affect agricultural production and household wealth.	No	No
Wondemu, K., Weiss, J., 2012. Rural Roads and Development: Evidence from Ethiopia. EJTIR 12, 417–439. http://www.ejtir.tudelft.nl/issues/2012_04/pdf/2012_04_04.pdf	This paper specifies the link between rural roads and household income in the context of a spatial equilibrium framework. The results show that road-induced rural income growth is substantially higher than what was reported by previous studies that used the same dataset. Road-induced factor productivity and returns to land and labour are also found to be the main channels by which better road access enhances rural income	No	No
Research/evaluations in progress			
Impact Evaluation of Rwanda Feeder Roads Program Date of completion: Unknown Concept note for evaluation: http://siteresources.worldbank.org/INTDEVIMPEVAINI/Resources/3998199-1285617002143/7430173-1335196588945/8602907-1336591491009/IDA_Rwanda_Feeder_Roads_IE.pdf World Bank PID: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/AFR/2012/05/17/44B82E7758EC238385257A01002BD4B5/1_0/Rendered/PDF/PID0Print0P126498005172012013372415248 54.pdf			

MiDA Ghana Feeder Roads Impact Evaluation

Date of completion : Unknown

Project information: http://www.mcc.gov/pages/countries/impact/impact-evaluation-for-ghanas-feeder-roads-activity

Project information: http://www.norc.org/Research/Projects/Pages/mida-ghana-feeder-roads-impact-evaluation.aspx

Impact Evaluation of Ghana Roads conducted by Vision and Optimal Consultants

Date of completion: Unknown

Power point presentation by John Hine (2006): http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPA/0,,contentMDK:21106054~menuPK:435390~pagePK:148956~piPK:216618~theSitePK:430367~isCURL:Y,00.html

Impact Evaluation for Armenia's Rural Road Rehabilitation

Date of completion: Unknown

Project information: http://www.mcc.gov/pages/countries/impact/impact-evaluation-for-armenias-rural-road-rehabilitation

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