TOPIC GUIDE:

Maximising the Benefits to the Poor from Infrastructure Programmes aimed at Increasing Growth

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Acronyms

ADB	Asian Development Bank
AfDB	African Development Bank
BP	British Petroleum
BRT	Bus Rapid Transit
BWADC	Behera Water and Drainage Company
CBO	Community-based Organisation
CGE	Computable General Equilibrium
CR	Corporate Responsibility
DC	Development Corridor
DFID	Department for International Development
DRC	Democratic Republic of Congo
EEPCo	Ethiopian Electric Power Corporation
ELNG	Egyptian Liquefied Natural Gas
ERR	Economic Rate of Return
ESMAP	Energy Sector Management Programme (World Bank)
FCAS	Fragile and Conflict-affected States
GDP	Gross Domestic Product
GGFR	Global Gas Flaring Reduction Partnership
GNP	Gross National Product
GPOBA	Global Partnership on Output-based Aid
GVA	Gross Value Added
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
ICT	Information and Communication Technology
IEG	Independent Evaluation Group
IFC	International Finance Corporation
IMT	Intermediate Means of Transport
IPP	Independent Power Producer
ITU	International Telecommunication Union
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MDC	Maputo Development Corridor
MDG	Millennium Development Goal
MCC	Millennium Challenge Corporation
MCC-JCC	China Metallurgical Group Corporation and Jiangxi Copper Corporation
NGO	Non-governmental Organisation
NMT	Non-motorised Transport
OECD	Organisation for Economic Cooperation and Development
PCO	Public Call Office
PIM	Participatory Irrigation Management
PPP	Public-private Partnership
PROSUL	Pro-Poor Value Chain Development in the Maputo and Limpopo Corridors
RC	Resource Corridor
RE	Rural Electrification
REF	Rural Electrification Fund
SDI	Spatial Development Initiative
SMME	Small, Medium and Micro Enterprises
ToC	Theory of Change
TOR	Terms of Reference
UAF	Universal Access Fund

VFM	Value for Money
VPO	Village Phone Operator
WUA	Water User Association

Glossary

Absolute poverty: Often referred to as 'extreme poverty'. Since 1995, the World Bank has defined extreme poverty as living on less than USD1.25 a day (adjusted for purchasing power parity).

Agricultural extension service: A service providing information and training for farmers, often as part of a multi-component project to improve agricultural productivity.

Associated infrastructure: The infrastructure that provides services such as transport, energy and water to an extractives operation.

Corporate responsibility: Voluntary integration by companies of social and environmental concerns into their business operations and interactions with stakeholders.

Development corridors: Geographical areas that link two growth/trade/industrial locations through a transport backbone. In order to deliver wider socio-economic benefits, development corridors may involve other interventions, such as feeder roads, to facilitate investment-led growth and to enhance the development of backward and forward links.

Direct jobs: These are jobs created through **direct** employment during construction, operation and maintenance of infrastructure.

Economic infrastructure: Defined here as transport, energy, information and communication technology, drinking water and sanitation, and irrigation.

Indirect jobs: These are jobs created in the supply and distribution networks associated with construction, operation and maintenance of infrastructure.

Induced jobs: These are jobs created in providing goods and services to directly and indirectly employed workers.

Intermediate means of transport: These fill the gap between motor and on foot transport and include wheelbarrows, bicycles, rickshaws, animal carts and wagons, motorcycles, motorised three-wheelers and two-wheel tractors.

Labour-based construction: Road construction broken down into small, simple activities that are easily carried out by hand, such as vegetation control, earthworks and graveling.

Non-motorised transport: This includes human-powered and animal-powered transport including walking, tricycles, pedicabs, rickshaws, handcarts, bullock carts, horse carts and camel carts, as well as head loads and shoulder loads.

Off-grid provision: This provides electricity to communities through infrastructure that is not connected to the main electricity grid.

Placement bias: This bias occurs when an area with the greatest potential for economic growth is chosen for a project.

Spatial poverty maps: Maps that show where there are gaps in infrastructure and services available to the poor.

Relative poverty: A standard of poverty defined in terms of the society in which an individual lives and which therefore differs between countries and over time. An income-related example would be living on less than x percent of average national income.

Resource corridors: Transport corridors established with the principal aim of enabling the transfer of minerals from mines to seaports and of supplies from seaports to mines. Although primarily benefitting the extractive sector, they have the potential to support other trade.

Telekiosks: Kiosks in villages that provide the poor with cheap access to the internet.

Theory of Change: A theory that sets out the causal mechanisms and pathways from project inputs to outputs, outcomes and impacts.

Universal access funds: Regulatory mechanisms that help extend access to ICT facilities through government subsidies.

Water user association: A group of water users, such as irrigators, who pool their financial, technical, material and human resources to operate and maintain a water system.

Summary

This Topic Guide provides advisers with an overview of how the poor can benefit from economic infrastructure projects. It focuses on projects that principally aim to boost economic growth and industrial development. In these projects, directly reducing poverty is likely to be a secondary outcome. In addition, the Topic Guide examines the potential for the infrastructure associated with the extractives sector to serve broader development goals.

The weight of literature suggests that improving economic infrastructure can boost economic growth. No country has sustained rapid growth without considerable public investment in infrastructure. However, while investment in infrastructure is a necessary condition for economic growth, it is not, on its own, sufficient. Investment has to be in appropriate, well-planned projects that are properly implemented and maintained. The broader environment must also enable conditions for growth. There is strong evidence that growth is key to long-term poverty reduction. However, to have a transformative effect on poverty, wider economic transformation that benefits the poor and shares prosperity broadly must accompany growth.

Economic infrastructure can bring *direct* benefits to the poor. Most significantly, the poor can benefit directly by using the services infrastructure provides, such as transport, information and communication technology (ICT), electricity and water for irrigation. Transport and ICT services allow poor people to access markets, health and education facilities. Access to clean water, sanitation and electricity has health benefits and means the poor have more time to spend on generating income. Poor people can benefit directly from jobs in constructing, maintaining and operating infrastructure.

The poor can also benefit *indirectly* from the spillover effects of economic growth stimulated by infrastructure services. New, cheap and reliable infrastructure services lower production and transaction costs and allow businesses to grow. The growth in economic activity and trade results in cheaper goods and services, which benefit the poor. The poor can also benefit from the jobs created by businesses that are growing and from new opportunities for self-employment generated by enhanced economic activity. The poor may also benefit indirectly as governments invest additional tax revenues generated by economic growth in public services.

The objectives of this Topic Guide are to:

- Assess the extent to which economic infrastructure projects and programmes can create benefits for the poor;
- Identify measures that have been adopted to provide benefits to the poor from infrastructure projects aimed at increasing growth; and
- Assess the effectiveness of measures that have been incorporated in infrastructure projects with the aim of creating benefits for the poor in each of the transport, ICT, electricity and irrigation sectors.

Evaluating the impact of economic infrastructure on poverty

There are several challenges in evaluating large economic infrastructure projects. Firstly, it is very difficult to identify suitable control groups for one-off, major infrastructure projects and then to attribute outcomes for such groups to infrastructure development. Secondly, the benefits from investment in infrastructure can vary widely, even for similar investments in the same country. Finally, it can take 20 to 30 years for the benefits for the poor to materialise.

To overcome these challenges, it is useful to develop a theory of change. Evidence collected before, during and after a project then serves to validate, invalidate or revise the hypothesis. The theory of change approach also provides information on the factors that have to be in place for an investment to generate positive outcomes. The theory should take account of the links between the investment in an infrastructure project, the economic growth generated by the infrastructure and the potential benefits to the poor.

Maximising the benefits to the poor: considerations by sector

Energy programmes to increase growth can create *direct* benefits for the poor in urban and rural areas by giving them access to electricity. The benefits include electric lighting, easier access to radio and television, improvements in education, time saved by women and girls by changing to electricity for cooking, and safer homes. There are also *indirect* effects from employment resulting from economic growth driven by more reliable electricity supplies. Businesses often cite inadequate power supplies as a key barrier to development. To maximise direct benefits to the poor, designers of energy projects should consider to what extent the poor will be able to access and pay for electricity, and to use electricity for productive purposes. In informal settlements in urban areas, projects also need to consider land tenure. Measures that enhance the direct benefits to the poor from energy infrastructure projects include:

- Subsidising suppliers to extend grids to cover less advantaged communities and/or remote areas;
- Providing off-grid power to serve remote communities in grid extension projects;
- Extending credit to households to meet connection charges through loans or monthly payments;
- Providing information to the poor so that they can make best use of a service;
- Building effective public-private-community partnerships in urban and peri-urban areas; and
- Negotiating community-benefit agreements to promote good relationships and increase the benefits that flow to stakeholders.

Where lack of energy is a binding constraint to private sector development, development agencies may argue that the primary effects on the poor will stem indirectly from economic growth. In such cases, they may not consider additional measures to deliver benefits to the poor a priority. However, project designers should consider evaluating the benefits that accrue to the poor, recognising that there are challenges in long causal chains.

Transport projects such as national and regional main roads, highways and railways principally benefit the poor *indirectly*, through the spillover effects of economic growth. There is evidence that transport infrastructure improves the livelihoods of the poor and has beneficial effects on health and education. The poor also *directly* benefit from employment opportunities during the construction and maintenance of transport infrastructure. Investment in transport infrastructure can also create operational jobs, particularly in urban transport, seaports and airports.

To maximise the benefit to the poor, project designers need to consider the accessibility and affordability of transport services, and transport 'links' to enable the poor to reach trunk roads and railways. The considerations differ in rural and urban areas. In urban areas in particular, the poor frequently walk or take informal forms of transport and so are often vulnerable to road accidents. Project designers also need to consider women's travel patterns and women's safety on public transport services. Highway and rail projects also need to assess the risks to local communities and transport workers of HIV/AIDS. To maximise the benefit to the poor, the following additional measures can be considered when designing transport infrastructure projects:

- Using spatial poverty maps to indicate gaps in the availability of transport infrastructure and services;
- Planning feeder roads and transport services to connect the poor to major highways, railways and urban transport systems;
- Including facilities for non-motorised transport in urban transport programmes, such as bicycle paths, pavements and pedestrianised streets;
- Subsidising transport services for the poor, or providing cross-subsidies;
- Setting flat-rate fares;
- Including road safety measures to reduce accidents and consulting women to identify safety and security issues;
- Including HIV/AIDS awareness programmes; and
- Developing local content policies to maximise employment, such as labour-based construction, and reserving jobs for particular groups, such as women.

Information Technology and Communication (ICT) projects can *directly* benefit the poor by providing access to information. Receiving information by mobile phone, for example, improves incomes, provides access to finance, increases security and strengthens social networks. Computers can provide access to information on business opportunities and health care. Access to the internet by local businesses can create *indirect* benefits for the poor through the jobs generated as the businesses become more productive. To maximise the benefits to the poor, project designers can consider improving the availability of mobile telephone and internet services, particularly in rural areas. An issue here is that the high costs of installation in remote areas leads to high consumer prices, which the poor are unable to afford. Consideration also needs to be given to literacy among the poor. ICT infrastructure projects can add the following measures to address these issues:

- Promoting competition to bring down prices;
- Encouraging ICT operators to share mobile network infrastructure to reduce costs;
- Using Universal Access Funds to subsidise rural internet services;
- Lowering taxes on mobile technology and services to increase service penetration;
- Providing free or subsidised public telephone services and telekiosks; and
- Providing information and training in using ICT.

Irrigation projects can *directly* benefit the poor. Irrigation allows more intensive cropping, delivers higher yields and allows farmers to grow profitable water-intensive cash crops. These outcomes all lead to higher incomes for farmers. Better-off farmers and those who own land are likely to benefit most from irrigation infrastructure. However, those further down the income scale, as well as the landless, can also benefit as better-off farmers and landowners hire more agricultural workers. The biggest risks to irrigation projects are low rates of return because of poor construction, operation and management. The following additional measures can be included in project designs to address these considerations:

- Improving operational management (e.g. by building capacity in water user associations or irrigation departments) to reduce water wastage, ensure fees are collected and generate sufficient funds for maintenance;
- Including agricultural extension services such as on-farm training;
- Improving on-farm water management;
- Compensating households for adverse environmental or social impacts; and
- Providing farmers who attend training activities with access to credit.

Infrastructure associated with extractives: Without additional measures, the poor generally do not derive significant benefits from infrastructure associated with extractives. Where the poor do benefit, the benefits tend to be *indirect* (e.g. from the growth of gross

national product) or highly localised. The specific characteristics of the extractives sector present challenges in delivering benefits to the poor. The extractive sector prioritises resource rents rather than social development. The relationship between developing country governments and private sector extractive companies can be unequal. Extractive industries are often in remote areas where the potential for development is poor because of the lack of productive forward links with the wider economy. To maximise the benefit to the poor from investment in extractive infrastructure the following measures can be taken:

- Developing resource corridors and auxiliary infrastructure to link extractive operations to wider development and, in particular, to encourage links to small, medium and micro enterprises, and pro-poor participation;
- Including requirements for local content to create local jobs, promote the development of local enterprises, and accelerate the transfer of skills and technologies to local people and businesses;
- Partnering initiatives between resource companies and governments that enable companies to contribute to social development goals but reduce their responsibility to deliver outcomes that are outside their expertise; and
- Leveraging private sector investment and providing incentives for corporate responsibility and voluntary action in pro-poor micro-projects through government, industry and civil society pressure.

Conclusions

This Topic Guide identifies strong evidence of *direct* benefits to the poor across all sectors particularly relating to job creation and increased incomes. We've also identified the same *indirect* benefits in the transport and energy sectors. This does not mean there are no *indirect* benefits in the ICT and irrigation sectors, but there are significant methodological challenges to attributing indirect benefits to infrastructure development.

Maximising the benefits to the poor from infrastructure projects means considering the following at the design stage:

- **Accessibility:** Address accessibility by extending infrastructure so that a larger proportion of the population can access services, for example by developing feeder roads to highways, extending electricity grids, investing in mini-grids, providing for non-motorised transport or extending broadband coverage;
- **Affordability**: Address affordability by subsidising access to services, for example by subsidising connections to the electricity grid, setting flat fares for urban transport or by encouraging competition in ICT;
- **Engaging communities**: Outcomes for the poor can be improved by engaging communities in formal consultations or as key stakeholders in partnerships, such as water user associations in irrigation and public-private-community partnerships in energy;
- **Information and training:** Providing information and training to poor communities can help them make best use of infrastructure services; and
- **Employment:** Create jobs along construction, operations and maintenance supply chains in all infrastructure sectors.

By including these pro-poor measures in project designs, there are additional direct benefits to the poor including time savings, self-employment opportunities, improved health and education and the lives of women and children. There is also a greater likelihood of a pro-poor outcome.

SECTION 1

Introduction

This Topic Guide provides advisers with an overview of how the poor can benefit from economic infrastructure projects. The Organisation for Economic Cooperation and Development (OECD 2006) defines economic infrastructure as infrastructure for transport, energy, information and communication technology, as well as for drinking water, sanitation and irrigation. For the purposes of this study, the authors examined all these sectors except water and sanitation, and focused on large-scale capital projects. Large projects principally aim to stimulate economic growth and industrial development. Direct impact on poverty reduction is likely to be a secondary concern. This Topic Guide also examines the potential of infrastructure associated with the extractives sector to serve broader development goals.

The weight of literature suggests that improving economic infrastructure can speed up economic growth. No country has sustained rapid growth without public investment in infrastructure (Commission on Growth and Development 2008). There is strong evidence that growth is key to long-term poverty reduction (ibid.). However, to significantly reduce poverty, growth must be accompanied by wide economic transformation that benefits the poor and shares prosperity broadly.

While investment in infrastructure is necessary for economic growth, it is not, by itself, sufficient (ibid.). First, the enabling environment (institutions, rule of law, etc.) must be in place. Then, investment in infrastructure has to be appropriate, well planned, well implemented and well maintained (Kenny 2009). This requires effective planning and project appraisal systems to choose the right projects for supporting economic growth, and decision makers who are not unduly politically motivated. Transparent procurement and management systems are also necessary to ensure effective delivery of design, construction, operation and maintenance, along with sufficient budgets to cover each of these phases in the project cycle. Evaluation of completed projects allows comparison of the final costs with the anticipated costs during project design.

In many countries, particularly low-income countries, these requirements are not in place (Dabla-Norris et al. 2011). Often this is due to the prevailing political economy and institutional capacity. A study of the political economy and the construction sector in Angola found that effective management in planning and implementing public investment projects was almost absent. The absence of enabling conditions creates a high risk of inappropriate projects that are badly carried out, and have little chance of benefitting the poor (Wells 2011). The risk is highest in fragile and conflict-affected states where underinvestment, lack of maintenance, and weak institutional and policy frameworks are intensified (Jones & Howarth 2009).

Where investment in economic infrastructure generates growth, the literature indicates that it can also bring benefits to the poor in a number of ways. Infrastructure can catalyse productivity and development. It can also enhance the impact of interventions to improve the poor's access to other assets including human, social, financial and natural assets (Seetanah 2012). For example, roads can provide access to markets, basic education and health facilities, and improve the overall productivity of poor households. Affordable access to infrastructure services such as ICT or electricity can enable the poor to save time, which they can use to increase their earnings through more productive work (IFC 2012). In a

review of econometric studies, Ali and Pernia (2003) conclude that transport, irrigation and electricity are essential in the fight against poverty.

Calderón and Servén (2008) provide robust evidence that infrastructure development – measured by an increase in the stock of infrastructure and better infrastructure services – has a positive effect on economic growth and reduces inequality. Over the last fifteen years infrastructure development has contributed to growth and equity in virtually all regions, and has made the greatest contribution in East and South East Asia. Infrastructure has also helped economic growth in sub-Saharan Africa, but to a much more modest extent than in Asia (ibid.). Calderón and Servén attribute this primarily *to the region's lack of progress on the quality of infrastructure services over the sample period*.

There is also debate about the amount and nature of investment in infrastructure needed to stimulate enough growth to tackle poverty (IFC 2012). Recent studies show that a 1 percent increase in infrastructure stocks would raise gross domestic product (GDP) by 0.08 percent. The impact varies by country and region according to the quality of a country's institutions, regulations and the degree of competition (ibid.). Estache and Garsous (2012) find that the investment needed to reduce poverty to achieve Millennium Development Goal (MDG) targets would amount to 4-6 percent of GDP in countries in Latin America, 6-5 percent in countries in Asia and 15 percent (10% in investment and 5% in maintenance) in Africa. The level of investment required rises to 25 percent of GDP in the poorest sub-Saharan African countries and to an even higher level in fragile and conflict-affected states (ibid.).

This Topic Guide examines how the poor can benefit from economic infrastructure by identifying the links between investment in infrastructure projects, economic growth and poverty reduction. It also provides examples of 'additional' measures – measures that can be included in the design of economic infrastructure projects and programmes – to maximise *direct* benefits to the poor. The objectives of this Topic Guide are to:

1. Assess the extent to which large-scale capital infrastructure projects and programmes can create benefits for the poor;
2. Identify measures that have been adopted to help the poor benefit from infrastructure projects aimed at increasing growth; and
3. Assess the effectiveness of measures to create benefits for the poor.

The Topic Guide addresses these objectives as follows:

- **Section 2** looks at the challenges of evaluating economic infrastructure projects and introduces a theory of change to address these challenges;
- **Section 3** takes a sector-by-sector approach, examining evaluations and appraisals to firstly identify the potential direct and indirect benefits to the poor from investment in each of the infrastructure sectors, secondly to assess pro-poor design considerations and lastly to identify additional measures that can be included in project designs to maximise the benefit to the poor;
- **Section 4** examines how investment in infrastructure associated with the extractive sector could be tailored to benefit the poor; and
- **Section 5** draws conclusions based on the evidence in Sections 3 and 4, and presents a theory of change that includes additional measures to enhance the benefits for the poor.

The bibliography includes abstracts of the key sources of information organised by sector and ranked according to the quality of the evidence.

SECTION 2

Evaluating the impact of economic infrastructure

Our understanding of the impact that economic infrastructure programmes have on poverty is limited. Compared with the large number of high quality evaluations (using randomised experimental approaches) of social infrastructure projects (water, health, education) there are few evaluations of economic infrastructure projects, and those that exist are often weak in showing causality. It is also often not possible to identify a control group for major one-off highway, port, rail or energy projects. Moreover, projects are often located in areas with the greatest economic potential, meaning that it is difficult to attribute outcomes to infrastructure development (Estache 2010). The evaluation of the Hubei-Xiogan-Xiangfan highway project in China illustrates this challenge. It was not possible to determine whether higher incomes in the villages were due to the project or to general growth of the economy (IEG 2009).

It is also important to recognise that the benefits from investment in infrastructure can vary widely, even between similar investments in the same country (Estache 2010). Benefits vary according to location and context. There may be differences in institutions, in legal and social incentives and norms, in access to financial resources, technological preferences and choices, as well as in prior levels of development (ibid.).

Further challenges to understanding the impact of economic infrastructure projects on poverty arise because it can take 20–30 years for the benefits for the poor to materialise. Yet evaluations are often conducted soon after project completion. In an evaluation of highways in Ghana, Jensen (2009) showed how it is possible, through a general equilibrium simulation (CGE) model, to explore the links between capital road works, road degradation and vehicle operating costs, productivity and socio-economic factors. He found that road and highway projects have important dynamic and socio-economic spillover effects that may extend over a very long term, with significant impacts on all socio-economic variables. Impacts include reducing poverty gaps and poverty years, as well as expanding employment.

Macro-economic modelling is costly and time consuming, but there are alternative approaches to overcoming some of the challenges outlined above. White and Philips (2012) set out a number of impact evaluation models that can be used when there are only a few ‘units of assignment’ (in our case one-off large-scale infrastructure projects) and where it is difficult to identify a suitable control. These models, based on a theory of change (ToC) together with a number of alternative causal hypotheses, establish causation beyond reasonable doubt. Evidence collected before, during and after the project validates, invalidates or revises the hypothesised explanations, and provides rigorous evidence of the links in the ToC (ibid.). The authors point to the potential bias in this approach because of how respondents report causal relationships and how evaluators gather and present evidence. Incorporating explicit and systematic approaches to collecting and analysing qualitative data in evaluations can mitigate these biases (ibid.).

The DFID team in the Democratic Republic of Congo (DRC) used a theory of change to explore the links between road construction and development. The analysis took account of conditions that needed to be in place that could not be addressed through the programme alone, such as security of the construction site, addressing potential negative consequences

and mitigating the knock-on effects of the programme (Vogel 2012). When developing the theory of change, a number of gaps in the data emerged that meant that ongoing research and evaluation would be needed to focus and adapt the DRC programme as conditions changed (ibid.).

We have used the theory of change approach to develop a conceptual framework for evaluating the impact of economic infrastructure on the poor. The theory of change in Figure 1 establishes the links (represented by the connecting arrows) between the initial investment in a project or programme through to the impact on economic growth and poverty reduction.

2.1 Identifying the benefits and risks to the poor

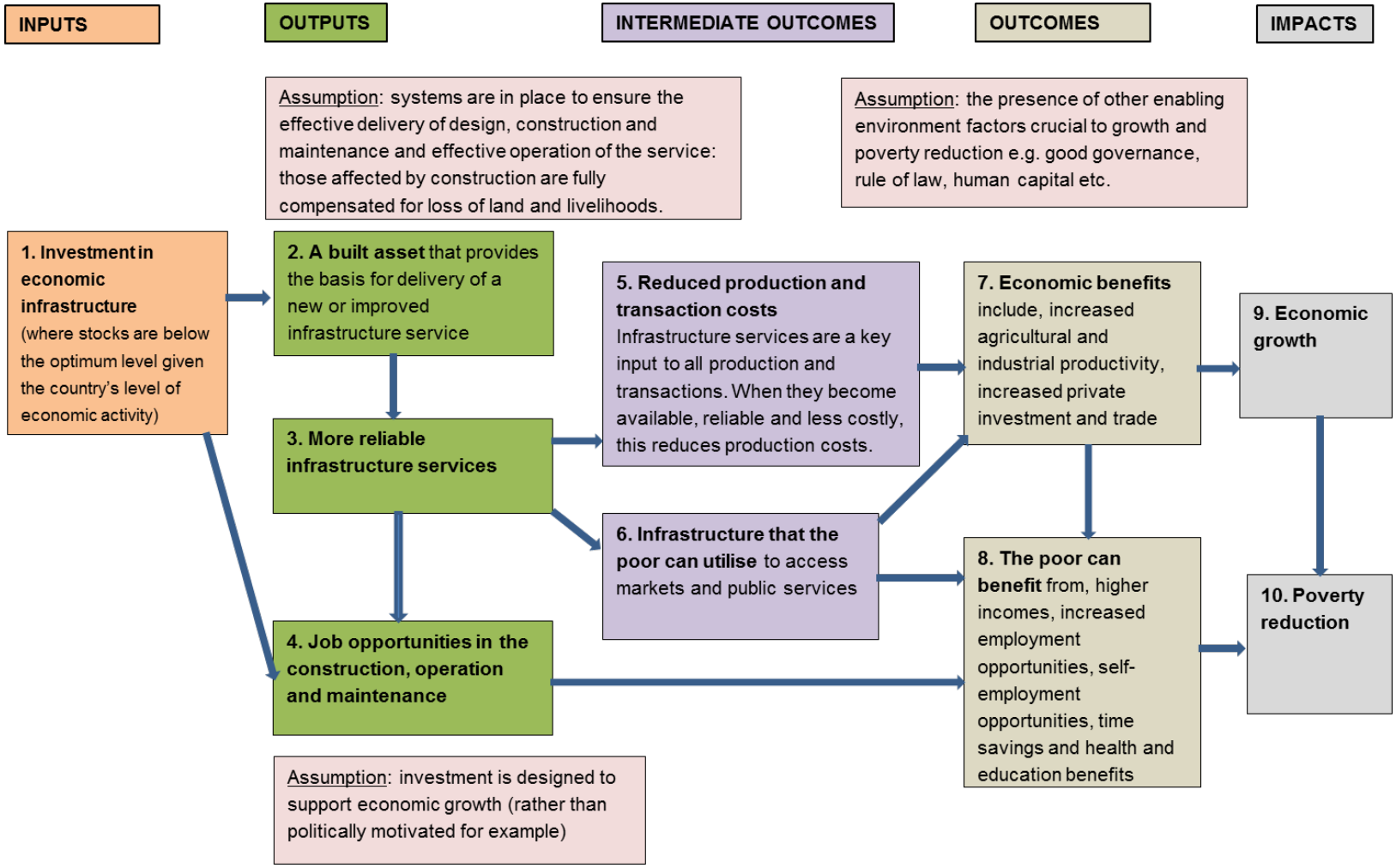
Poverty has traditionally been defined in monetary terms. Since 1995, the World Bank has defined extreme poverty as living on less than USD1.25 a day (adjusted for purchasing power parity). However, poverty is more complex than simply a lack of income. Lack of access to services, a lack of voice and power, and excessive vulnerability and exposure to risk also make people poor (World Bank 2001). The benefits set out in our ToC (Figure 1 box 8) reflect these multi-dimensional aspects of poverty.

The poor can benefit *directly* from using the services provided by infrastructure (transport, ICT, electricity, water for irrigation etc.). Transport and ICT services allow poor people to access markets, health and education, while access to water and electricity brings health benefits and can free up time for income generating opportunities (Figure 1 box 8) (Commission on Growth 2008). The poor can also benefit directly from jobs created in constructing, maintaining and operating infrastructure (Figure 1 box 4). Construction is labour intensive in most parts of the developing world, and creates many low-wage jobs. The construction and maintenance supply and distribution networks involved in infrastructure multiply the number of jobs directly created (IFC 2013). There are also jobs 'induced' as a result of workers spending their wages on household goods and services.

Evidence for short-term job creation is relatively strong. For example, an analysis of the potential employment effects of infrastructure projects in the Middle East and North Africa region that used job creation data from similar projects found that for every USD1 billion invested in infrastructure, on average, 110,000 jobs could be created in oil-importing countries, 49,000 in developing oil-exporting countries and 26,000 in Gulf Cooperation Council countries (Estache et al. 2012). Evidence from Latin America and the Caribbean region suggests an investment of USD1 billion in infrastructure would generate approximately 40,000 jobs (IFC 2013).

The poor can also benefit *indirectly* (second-order benefits) from growth generated by infrastructure (IFC 2012). For example, higher agricultural and industrial productivity stimulated by infrastructure, coupled with a growth in trade, can create new jobs or self-employment opportunities, as well as making goods and services less costly for poor households. Infrastructure can also bring in new revenues, which governments can spend on social services such as schools and hospitals that benefit the poor (ICAI 2013).

Figure 1 Theory of change for investment in economic infrastructure without additional measures to benefit the poor[1]



[1] Figure 1 is based on a theory of change developed by Lily Ryan-Collins, Department for International Development.

The poor may also suffer adverse effects from economic infrastructure projects. Firstly, if evicted to make way for infrastructure and not properly compensated, the poor may lose land, housing and opportunities for earning income. This is very apparent in the case of dams constructed for irrigation. Environmental pollution and degradation resulting from projects can also affect the livelihoods of the poor in the vicinity and upstream of dams (Duflo & Pande 2005). Secondly, some of the economic benefits brought about by infrastructure services may have a negative impact on some sections of the rural or urban poor. For example, if expansion of a grid into previously unserved areas leads people to switch to electricity for cooking, the livelihoods of those working in the charcoal trade may suffer. Similarly, improving transport links such as bridges may destroy the livelihoods of ferry operators and bicycle transporters. Finally, secondary effects from infrastructure, such as an increase in trade may create negative outcomes for the poor. Growth in trade may mean that inefficient activities involving the poor may face greater competition, with the result that their incomes fall (DFID 2010).

It is generally accepted that households should be compensated for losses suffered as a direct result of construction and that the costs of compensation should be included in the total cost of a project (refer to assumptions in Figure 1). However, the evidence suggests that poor households often do not have legal title to land and property, and that compensation is either not received or is inadequate to allow them to rebuild their livelihoods. In some cases, including the full costs of re-settlement in project budgets can make projects uneconomic, which is why these costs are often excluded (Duflo & Pande 2005). Compensation for losses resulting, directly or indirectly, from the delivery of a service (known as the 'transition costs') is unlikely to be forthcoming. There is very little evidence on 'transition costs' due to a lack of research. This kind of information is usually kept confidential.[2] Transition costs should be included in cost-benefit calculations to ensure that the full impact on the poor has been captured. However, it is important to recognise the significant challenges involved in accurately capturing transition costs.

Section 3 sets out the direct and indirect benefits for the poor for each infrastructure sector addressed in this Topic Guide.

2.2 Additional measures to maximise the benefit to the poor from infrastructure

Incorporating additional measures into the design of economic infrastructure projects and programmes can maximise benefits for the poor. Additional measures can:

- Improve accessibility;
- Improve affordability; and
- Mitigate the risks of potential negative impacts.

Maximising the benefit to the poor from new infrastructure and preventing negative outcomes often requires involving and consulting poor people during project conception and design. Any 'additional' measures to benefit the poor need to be identified at an early stage of project development, considered as a core part of the design and allocated sufficient budget to ensure implementation. The evaluation reports of African Development Bank (AfDB)-funded road schemes in Kenya, Botswana and Lesotho show that anticipated poverty impacts were not realised because socio-economic aspects such as HIV/AIDS and local cultural practices were not considered during project design (AfDB 2007; AfDB 2011a; 2011b). These evaluations also show that identifying appropriate baseline indicators is

[2] Peer review meeting with Prof. Antonio Estache, European Centre for Advanced Research in Economics and Statistics (ECARES), Université Libre de Bruxelles (ULB).

important (AfDB 2011b). In a study of ICT projects, Kendall and Singh (2006) also stress the importance of considering the local context when designing projects to ensure that the project's structure and policies prevent any form of discrimination.

The challenge is to strike a balance between investing in 'additional' measures to benefit the poor and ensuring value-for-money (VFM) in achieving the main project objectives. Jackson (2012) argues that VFM is about 'striking the best balance between the three Es – economy, efficiency and effectiveness'. DFID (2011) adds a fourth 'E', 'equity', 'making sure our development results are targeted at the poorest and include sufficient targeting of women and girls'. The four 'Es' provide a sound basis for assessing the VFM of all inputs, including additional measures.

In Section 3 we summarise the potential direct and indirect benefits to the poor from investment in the energy, irrigation, ICT and transport sectors. We then identify pro-poor design considerations and potential additional measures to maximise benefits for the poor.

SECTION 3

Benefits to the poor from economic infrastructure: by sector

3.1 Energy

Energy programmes aimed at increasing growth can create *direct* benefits for the poor. Access to electricity improves access to information, saves women and girls time, and opens up greater possibilities for household enterprises. While investment is needed to generate, as well as to transmit electricity, we did not find any evaluations of the impact of investment in large power generation projects on poverty. We may assume that the *direct* benefits to the poor from such projects are likely to be restricted to jobs in construction. While there are likely to be significant *indirect* benefits from a regular supply of electricity, the benefits accruing to the poor would be impossible to trace in the absence of a general equilibrium model. The focus of this section will therefore be on transmission and distribution infrastructure rather than infrastructure for generating electricity.

3.1.1 Potential benefits

Evaluations in the energy sector mostly focus on the benefits from rural electrification (RE) projects. For example, Fan and Chan-Kang (2002) found that for every 10,000 yuan (USD1200[3]) spent on electricity development 1970–97, 2.3 persons were brought out of poverty. Balisacan et al. (2002) did a similar analysis for Indonesia in 1990 and concluded that a 10 percent improvement in access raised the income of the poor by roughly 2 percent. Escobal and Torero (2005) drew comparable conclusions on the gains from electrification in Peru. However, some of the studies did not select the treatment areas randomly and did not allow for the fact that electricity is often installed first in areas with the greatest potential for economic growth, often referred to as 'placement bias' (Estache 2010).

Dinkelman (2011) in South Africa and Bernard and Torero (2011) in Ethiopia have developed innovative methodologies to address these biases. The latter study also addresses the potential bias that arises from inherent differences between households that have chosen to connect and households in the control group (referred to as 'self-selection bias'), but unfortunately the findings have not yet been published.[4] Dinkelman (2011) found that within five years of connection to the grid, female employment increased by 13.5 percent but that there was no increase in male employment. The rise in female employment was driven by middle-income households formerly reliant on wood fuel for cooking which had sufficient income to change to electricity. The poorest households could not afford to make the switch. The women most affected were those with the flexibility to respond to opportunities for employment. These women were usually in their thirties or forties and less likely to live with young children requiring full-time care (ibid.).

3 Based on a 1997 exchange rate of 8.3 yuan to USD1.

4 We contacted the author who confirmed that the paper was still awaiting publication.

The potential direct benefits to the poor from rural and urban electrification infrastructure include:

- Households have easier access to communication tools (radio, television and telephone) and benefit from electric light at night (IPIECA 2006);
- Education levels improve as children have light to do their homework at night and suffer less damage to their eyes (IEG 2008b; ESMAP 2007);
- Safety in the home improves as families no longer use oil and paraffin lamps, candles and small petrol generators, reducing the risk of accidents (ibid.);
- Women and girls save time by changing to electricity for cooking (Dinkelman 2011); and
- Safety of women in urban areas improves due to street lighting (ESMAP 2007).

In addition there are indirect benefits including:

- Employment because electricity is available for productive purposes and electricity supplies are more reliable (IFC 2013). This is likely to be particularly significant in low-income countries where inadequate electricity supplies are often a binding constraint on growth (Foster & Briceño-Garmendia 2010); and
- Higher disposable incomes (ESMAP 2007).

3.1.2 Pro-poor design considerations

a. Accessibility and affordability

An Independent Evaluation Group (IEG) review (2008b) identifies accessibility and affordability as the key barriers preventing the poor from benefitting from electrification. The IEG review of 120 World Bank-supported projects that involved rural electrification (RE) found that the non-poor capture the largest share of the benefits. Key factors in accessibility and affordability are access to the grid and connection charges once the grid is available.

In many countries, one of the criteria for deciding where to place transmission lines is 'least cost'. This means that larger communities nearest to existing grids, towns and roads, which are not necessarily the areas with the poorest people, are served first. For example, the Rural Energy Project in Vietnam proposed to extend electricity only to communes where at least 60 percent of households confirmed their willingness to pay the connection charges (GRIPS Development Forum 2003). Sometimes the decision to serve more affluent groups is explicit, for example the Indonesian Government's decision to target areas with a poverty rate of less than 20 percent although the poverty rate nationally averaged 45 percent (Meier 2001). While this kind of targeting might be necessary to ensure the financial viability of projects, it means that communities with many poor people are less likely to be connected to the grid.

Even if an electricity supply is within reach, the poor may be unable to benefit because they cannot afford to pay for a connection. The evidence suggests that this is a serious hurdle for poorer households. Most households that can afford to connect do so within the first few years. However, in Thailand 25 percent of households in electrified villages remained unconnected after more than 20 years (Green 2005). Likewise, while electricity was available in most parts of rural India by 2002, the percentage of households connected still varied considerably. In some provinces, 90 percent of households had an electricity connection, while poorer provinces like Rajasthan and West Bengal lagged behind with 33 percent and 22 percent of households connected, respectively (ESMAP 2002).

b. Land tenure and affordability in urban areas

Despite some progress in improving access to electricity in urban areas, governments in many low-income countries are struggling because of very rapid urbanisation (ESMAP 2007). A high proportion of the urban poor lives in informal settlements without formal land tenure. Government regulations may prevent service providers from serving such settlements. Reaching them may be complicated. The costs of electrification can be high because streets are narrow and physical conditions in the settlements difficult (ibid.). These problems often lead to illegal connections and informal businesses that provide electricity at high prices (ibid.).

c. Benefits are not as expected

The benefits to the poor are not always as expected. An investigation by the IEG (2008b) found that rural households mainly used electricity for lighting, followed by television. Except in East Asia, where electric rice cookers are common, households rarely use electricity for cooking. While access to television may improve women's knowledge about health, and bring health and fertility benefits (ibid.), the benefits on women's health and the time savings expected from displacing firewood or kerosene stoves were not realised (ibid.). The effect of RE on employment in South Africa cited above (Dinkelman 2011) is a notable exception.

d. Non-productive use

The IEG (2008b) also found that RE does not appear to drive industrial development and that few households use electricity for productive purposes. While electricity can provide an impetus for home businesses, the broader literature found that the effect was less than expected, except where there was a specific programme to promote productive use of electricity (ibid.). Connected households may not be making the best use of electricity because of pricing structures. In many countries, a low-rate flat tariff applies to a fixed amount of electricity (usually 25 kWh per month but as much as 50 kWh). But tariffs are not transparent and not well understood, so households may limit their consumption unnecessarily (Case Study 1). Consumer education would both stimulate demand and ensure consumers derive maximum benefit at least cost. World Bank-supported projects have typically neglected pricing and education components (IEG 2008b).

Case Study 1 Tariffs can disadvantage the poor

The Zanzibar State Fuel and Power Corporation has a flat-rate tariff for up to 50 kWh per month. However, many consumers are unaware of this, partly because their monthly bills vary because of irregular meter readings. On average, villagers consume only 25 kWh per month, even though they could use twice as much at the same cost. One villager limited his use of electricity to just 3 kWh a month – equivalent to burning one light bulb for 1.5 hours per day – in a futile attempt to save money.

Source: Winther, T. (2005) *Current Styles: Introducing Electricity in a Zanzibari Village*. Unpublished doctoral dissertation, Department of Social Anthropology, University of Oslo

3.1.3 Additional measures to enhance direct benefits

The issues discussed above suggest that infrastructure projects that aim to generate significant direct benefits for the poor may need to incorporate additional measures. Possible additional measures are described below and summarised in Figure 2. Most of the examples refer to rural electrification, but the approaches could also apply to urban settings.

a. Subsidising suppliers to reach unserved areas

Subsidies to private providers can offset financial losses or lower profits incurred by extending a grid to less advantaged communities and/or remote areas. Some countries have set up rural electrification funds (REFs) for this purpose (e.g. Case Study 2). Publicly owned

utilities may also need subsidies, as is the case in South Africa (Eberhard et al. 2008). The World Bank has supported funds for subsidies in a few cases (IEG 2008b).

Case Study 2 Chile Rural Electrification Fund

Chile's rural electrification programme, launched in 1994, included creating a special rural electrification fund (REF) linking subsidies to output targets. This fund competitively allocates one-time direct subsidies to private distribution companies to cover part of their investment costs in RE. Local operators apply for a subsidy by presenting a project proposal; the proposals are scored against a checklist of objective criteria, including cost-benefit analysis, operator investment commitment and social impact. The central government allocates subsidies to regions according to the number of un-electrified households and the progress each region has made in RE during the preceding year.

Sources: Jadresic, A. (2000) 'A Case Study on Subsidising Rural Electrification in Chile', in *Energy Services for the World's Poor*, World Bank: Washington DC; Tomkins, R. (2001) 'Extending Rural Electrification: A Survey of Innovative Schemes', in P.J. Brook & S.M. Smith (eds.) *Contracting for Public Services: Output–Based Aid and its Applications*, World Bank: Washington DC.

b. Off-grid provision

There is growing support for including off-grid electricity as an additional measure in energy infrastructure projects. Off-grid electricity, often using renewable sources, is the least-cost way to serve remote communities but is more expensive if a community could be reached through the grid. The least-cost means of achieving universal access will probably combine on-grid, mini-grids and household systems. Some form of subsidy to providers may be needed as well as subsidies for households to cover connection costs. Subsidies are in fact quite common in off-grid programmes: 22 of 33 projects with off-grid components reviewed by the World Bank (IEG 2008) included subsidies, and 86 percent of these were up-front capital cost subsidies.

Experience from Nepal, Peru and Kenya suggests that mini-grids are most beneficial to the poor when they produce energy from multiple sources as part of multi-component projects that also include improving access to markets, roads, transport and communications (Yadoo & Cruickshank 2012). However, mini-grids only create significant benefits for the poor if the supply of energy is reliable and sufficient to meet household needs, which is not always the case (Shyu 2012). Still, mini-grids are an attractive option in remote areas, especially when combined with hydropower (Eberhard et al. 2008). Solar-powered electrification of clinics and schools that serve low-income communities is another way of allowing even the chronic poor to reap the benefits of electricity (Foster & Briceño-Garmendia 2010).

c. Loans, staged payments and micro-credit to meet the cost of connection

A few projects have extended credit to households to meet connection charges by providing loans or by allowing households to pay in monthly instalments. An example of the former is the Electricity Rural Access Programme in Thailand, which made loans available for a year after villages had been connected to the grid, and charged one percent interest. The scheme was discontinued as it was not found to be sufficiently encouraging (IEG 2008b). Morocco and Senegal have introduced repayment for connection charges by monthly instalment over long periods (15-20 years in Morocco).

Providing micro-credit to pay for the cost of connection has also been trialled in Ethiopia. A few years ago, the Ethiopian Electric Power Corporation (EEPCo), the state electricity utility, introduced a programme allowing connection charges to be repaid over five years with no interest. EEPCo later reduced the repayment period two years. The programme accelerated the pace of connection: it is estimated that the five-year plan increased connections in electrified villages by 20 percent and the two-year plan by 10 percent (IEG 2008b). However,

the programme used up much of EEPCo's working capital. A project supported by the Global Partnership on Output-Based Aid (GPOBA) is now providing EEPCo with a performance-based subsidy (Case Study 3).

Case Study 3 Global Partnership on Output-Based Aid supports the Ethiopian Electric Power Corporation (EEPCo)

GPOBA granted USD8 million to EEPCo to connect 229,000 customers and provide them with five-year loans to cover 80 percent of the estimated cost. Customers pay 20 percent of the loan up front. The balance is repaid as 60 monthly payments of USD1, which are rolled into the electricity bill. The project evaluation used an experimental method that assessed the effect of randomly distributed vouchers on households' decisions to connect. The findings will enable evaluators to assess the extent to which households respond to different levels of financial incentive to connect to the grid. The results of the evaluation are currently under review pending publication in the World Bank Economic Review.

Source: Maurer, L. & Nonay, C. (2009) 'Output-Based Aid in Ethiopia: Dealing with the 'Last Mile' Paradox in Rural Electrification', *OBA Approaches, Note Number 27.*

While the estimated cost of connecting households to the grid is only 3 percent of the total upstream cost of providing electricity services, the cost still has to be covered without endangering the sustainability of a project. A subsidy for connecting households below the poverty line to the electricity grid in India had some unintended consequences (Case Study 4).

Case Study 4 India's experience with the single point light connection scheme

Under an Indian Government social welfare programme, India's Rural Electrification Corporation supplied state electricity boards with financial assistance usually in the form of loans to cover the cost of low-voltage connections for households below the poverty line. More than 5.8 million households in rural areas have benefitted. But the utilities became reluctant to continue connecting households because of thefts of electricity and high maintenance costs. The number of new villages electrified dropped from 100,000 between 1985 and 1990 to 11,000 between 1997 and 2002. In response, the government reformulated its RE scheme by increasing the government's share of the cost of new infrastructure to 90 percent.

Sources: Bhattacharyya, S.C. (2006a) 'Energy Access Problems of the Poor in India: Is rural electrification a remedy?' *Energy Policy 34 (18)* p3387-3397; Bhattacharyya, S.C. (2006b) 'Universal Electrification: Will the New Electrification Programme Succeed in India?' *OPEC Review 30 (2)* p105-123.

d. Information to make best use of a service

Consumer education may be needed to stimulate demand and to help the poor to make the most of an electricity service. Many countries supply a fixed amount of electricity at a low flat-rate tariff to poor users, but tariffs are not transparent and not well understood. Households may thus limit their consumption. The poor may need information on how to make best use of electricity. They may need access to energy efficient technologies appropriate to the local context and their needs. Programmes demonstrating how to use electric appliances effectively could bring added value to households by generating income, saving time or effort or allowing access to education (Foster & Briceño-Garmendia 2010).

e. Building effective public-private-community partnerships

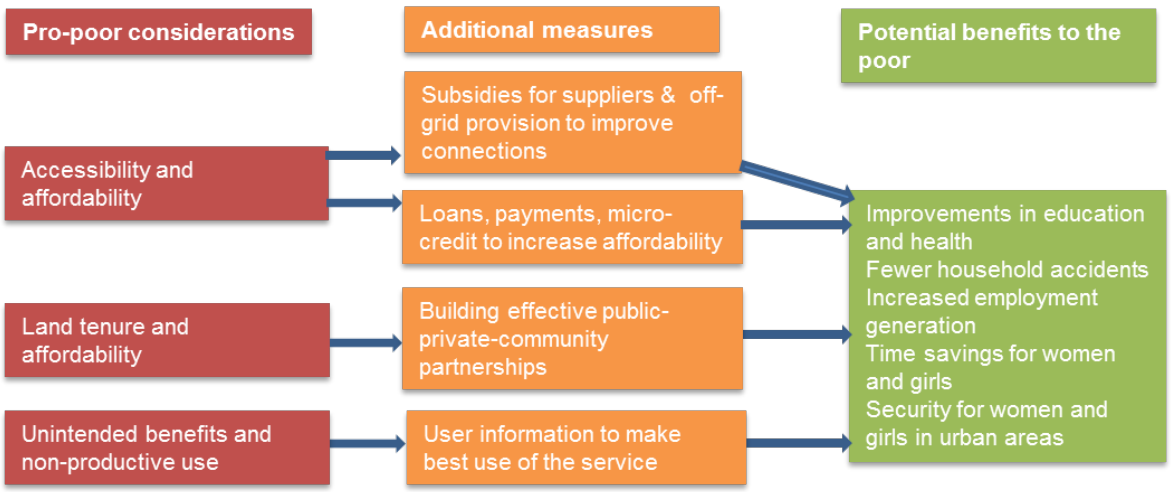
The World Bank's Energy Sector Management Programme (ESMAP) indicates that the chances of successful electrification in poor peri-urban and urban areas are greater when utilities partner with local government and community-based or non-governmental organisations (ESMAP 2007). Working with local government provides utilities with a coherent legal framework to solve land tenure problems, legitimise consumers and connections, and work through law enforcement institutions to increase compliance and reduce pilferage. Community-based and non-governmental organisations (CBOs and NGOs) help to build trust and confidence among a range of energy stakeholders, mobilise communities to understand their rights and obligations, link utilities to slum dwellers and raise government awareness (ibid.). ESMAP provides numerous examples of such partnerships in India, Brazil, Columbia and Haiti.

f. Community-benefit agreements

Based on a model from the extractive sector, some energy projects are now developing community-benefit agreements. The purpose of these agreements is to improve relationships among all stakeholders, and to promote benefits that flow to these stakeholders (Capusano et al. 2012). An example of a community-benefit agreement is the CASA-1000 project in Central Asia. The objective of the project is to build an electricity transmission system linking Tajikistan and the Kyrgyz Republic to Afghanistan and Pakistan. Although there is a debate about the overall benefits the project will deliver to the region, Community benefit-sharing studies are in progress in each country to identify community benefits. The study recommendations will be incorporated into the design, construction and operation of the project,

Figure 2 summarises pro-poor design considerations in energy infrastructure projects, and additional measures that have potential benefits for the poor.

Figure 2 Pro-poor design considerations, additional measures to benefit the poor and the potential benefits in the energy sector



3.2 Transport

A number of studies highlight the positive role of transport infrastructure in alleviating poverty. In a study of 21 African economies between 1980 and 2007, Seetanah (2012) found that a 10 percent increase in transport capital in a country was associated with a 2.4 percent decrease in poverty. This finding is consistent with studies by Khandker (1989), Datt and Ravaillon (2002), Fan and Chan-Kang (2005), and Warr (2005). However, many studies only examine the immediate economic benefits and do not consider the long-term impact (Jensen 2009). Taking the long-term impact into account, Jensen (2009) found that the socio-economic spillover effects of roads in Ghana played a key role in economic growth by accounting for more than half of the lifetime benefits of capital road works. On 100 km of a two-lane asphalt road the benefits included an additional 95,000 workers in employment and a reduction in the number of people in poverty by 52,000 (ibid.).

3.2.1 Potential benefits

A study by the Asian Development Bank graded the contribution of transport subsectors to inclusive growth (Table 1).[5] In major highway and railway projects, the main benefits to the poor were indirect, generated by the spillover effects of economic growth (Hansen 2010). For example, an increase in trade can lower the price of goods and services that poor households buy. More trade can encourage businesses to hire new staff or increase wages (ICAI 2013) and can also generate new revenues for governments to spend on public services. For example, a major highway between Ghanzi and Gaborone in Botswana contributed to the development of seven new hospitals/clinics and seven new schools. Community surveys found that government service providers (water, electricity etc.) had much better access to the communities they serve (AfDB 2011a).

Table 1 Contribution of transport subsectors to inclusive growth

Transport subsector	Contribution to inclusive growth[6]
Highways	Medium
Railways	Medium
Rural roads	High
Ports	Low to medium
Inter-island transport	High

Source: Hansen S. (2010) 'ADB's Contribution to Inclusive Growth in Transport and Energy Projects', Asian Development Bank Sustainable Development Working Paper Series

An IFC (2013) study on jobs indicates that assessments of the growth-related effects of transport on employment are scarce. But there is some evidence that the livelihoods of the poor improve indirectly. For example, a comprehensive study of rail networks in India (Donaldson 2012) examined data gathered from the colonial era and found that real agricultural incomes increased by 16 percent in districts linked to the rail network compared with districts that were not connected. In addition, a study on the impact of infrastructure investment on agricultural productivity in East Asia and the Pacific, South Asia, Europe and sub-Saharan Africa found that roads can provide indirect benefits by raising rural incomes (Knox et al. 2013).

5 ADB's criteria for inclusive growth include: i) the impact on growth and employment for lower income groups and excluded groups; ii) the impact on asset distribution; iii) the impact on human capability (health, education etc.); iv) the impact on social protection and risk mitigation; and v) sustainability and governance of the project.

6 The inclusive growth contribution of the projects evaluated was analysed and rated on a scale of 0-10 (0-3 little contribution; 4-6 medium contribution; and 7-10 high contribution).

Rural roads can directly benefit the poor by connecting isolated villages to markets and services. The Asian Development Bank study found that among investments in transport infrastructure, investments in rural roads had the most impact on inclusive growth. Better rural roads led to improvements in social development indicators such as school enrolments and increased consumption (DFID 2013). Evidence from Peru (Escobal & Ponce 2003), Bangladesh (Khandker et al. 2006) and Vietnam (Mu & van de Walle 2007) supports these conclusions.

The poor may also benefit directly from opportunities for employment during construction and, to a lesser extent, jobs in maintaining transport infrastructure. The impact of this employment is mixed. One survey showed that household income increased by as much as 78 percent in the short term but had no lasting impacts (DFID 2013). Other surveys showed more lasting impacts on social welfare and productivity, such as on food security (ibid.). There are also numerous operational jobs, particularly in urban transport (Goddard 2011), seaports and airports. However, it may be hard for the poorest people to obtain these jobs as they often require literacy and professional skills that they do not possess (ibid.). Jobs can also be induced, for example, a container port terminal in Brazil led to the expansion of firms that generated 6,205 jobs (IFC 2013).

3.2.2 Pro-poor design considerations

a. Access to transport services

DFID (2013) points out that the evidence as to whether transport interventions benefit the poorest quintiles disproportionately or even equally is inconclusive. Road programmes may increase proximity to facilities, and product and labour markets but this does not automatically mean the poor have better access. Where transport services are scarce, the costs are likely to be more than the poorest can afford, especially for regular or frequent trips (ibid.).

Improvements in urban transport services have the potential to benefit the poor. For example, a 1 percent increase in urban transport infrastructure in Mauritius resulted in a 0.14 percent fall in poverty (Shalini & Boopen 2011). But the poor often live in informal settlements on the outskirts of cities where inadequate transport connections mean walking is their main mode of transport (Pendakur 2011). Motorised transport is often relatively expensive, which means the poor are less likely to benefit (Goddard 2011). In rural areas, the poor may be marginalised if transport links are more than a few kilometres from their village or transport services are unaffordable. In a study of rural communities in Ethiopia, Dercon (2006) found that roads and access to towns were the most important factors in growth of consumption and reducing poverty. The study demonstrated that communities with poor road infrastructure and poor urban links did not recover as quickly from the 1980s civil war as communities with good infrastructure (Dercon 2006).

b. Women may be adversely affected

Women may also not benefit from or be adversely affected by new transport links. Urban transport systems tend to suit men, who have routine travel patterns between home and work during peak hours. In contrast, women have more varied travel patterns that involve trips to health centres, schools, shops and families as well as work, and frequent short journeys during off-peak hours (World Bank 2010). They tend to travel for longer and have less access to private vehicles. For example in Bamako, Mali, only 13 percent of women have access to private transport compared to 44 percent of men (DFID 2013). This lack of mobility disadvantages women workers disproportionately. For example, in Delhi when 700,000 squatters were resettled on the periphery of the city, female employment fell by 27 percent because travel time increased three-fold (DFID 2013). New roads and rail links can

make women more vulnerable to health and safety risks, including HIV/AIDS and human trafficking. Women also risk verbal harassment and physical attacks on public transport systems (Babinard et al. 2010).

c. Road safety

Road accidents are a major hazard for the poor. Pedestrians account for 40 percent of all road fatalities in Africa (Pendakur 2011). The current level of road traffic accidents in low and middle-income countries is disproportionately high considering their relatively limited road infrastructure. Africa is the region with the worst death rate from road accidents, with a fatality rate of 24 deaths per 100,000 (DFID 2013). Globally, road injuries are the number one cause of death among 15–24 year olds (Global Burden of Disease 2010). Fatality, injury and disability arising from road accidents can aggravate household poverty. A study in Bangladesh found that road crashes reduced incomes and food consumption and, in some cases, pushed non-poor families into poverty (ibid.).

d. HIV/AIDS

HIV/AIDS is a major risk for local communities and transport workers, particularly in transport corridors. Monitoring and surveillance studies of truck drivers' behaviour and knowledge about HIV showed that drivers' awareness of AIDS tended to be poor and that they had misconceptions about using condoms and HIV transmission (World Bank 2009).

3.2.3 Additional measures to enhance direct benefits

a. Spatial poverty maps

Transport links have a significant impact on whether the poor will benefit. The World Bank (2002) recommends the use of spatial poverty maps that indicate the availability of transport infrastructure and services when selecting projects. A spatial analysis of the impact of potential infrastructure investment on the broader economy helped prioritise infrastructure in the Democratic Republic of Congo (Foster & Benitez 2011 2011). The analysis showed that the returns to transport investments would be highest if they were packaged together to promote mobility along key economic corridors in the country (ibid.). Fan and Chan-Kang (2005) showed that investment in roads in eastern and central regions of China would deliver the highest economic return as these areas had a higher concentration of business and labour than other areas. However, road investment in the geographically remote west of the country would contribute more to poverty reduction (ibid.).

b. Feeder roads and intermediate means of transport

The key to maximising the benefits to the poor from major highway and railway links is to include the construction of feeder roads to connect the poor to the infrastructure. An evaluation of the USD860 million Hubei-Xiogan-Xiangfan highway project in China, which included a programme to connect poor villages to the highway, found that incomes in the villages increased by 50 percent although it was not clear that this could be directly attributed to the project (IEG 2009).

The poor are best able to use feeder roads where they have access to both motorised and intermediate means of transport (IMTs) such as bicycles, motorcycles, rickshaws, animal carts, motorised three-wheelers and two-wheel tractors. IMTs can save the poor significant time and improve productivity (DFID 2013). A World Bank evaluation (2012) of the Lima Bus Rapid Transit (BRT) system demonstrated how connecting major urban transport projects to the poorest areas of a city can overcome urban geographical remoteness (Case Study 5).

Case Study 5 Connecting the Lima Bus Rapid Transit System (BRT) to poor urban areas

A USD133 million BRT in Lima, Peru, included measures to improve access to the city from low-income areas, such as pavements, and provision for cycling and walking. Before the BRT, about a third of total daily trips were on foot and journey times for poor urban workers averaged 1.5 to 3 hours per day. An evaluation of the BRT showed that 46 percent of users were from low-income areas and that journey times were cut by 34 percent because feeder buses connected the main terminals at each end of the line to the poorest parts of the city.

Source: World Bank (2012a) 'Implementation and Results Report to the Government of Peru and for the Lima Transport Project'.

c. Non-motorised transport

Considering measures for non-motorised transport in urban transport programmes is critical if the poor are to benefit. Non-motorised components of urban transport in Bogota, Columbia, include bicycle paths, new pavements and pedestrianised streets. Air pollution has fallen by 60 percent and travel times by a third (Pendakur 2011). A pilot programme in East Africa introduced a similar range of measures (Case Study 6).

d. Direct measures on fares

Measures such as setting fares to minimise the cost of public transport for the poor should be considered. However, there is some scepticism that such measures actually benefit the poor, as they may not even be able to afford low fares (Goddard 2012). For example, the Lima BRT introduced flat fares but the evaluation found that many residents said that the service was too expensive (World Bank 2012). Significant up-front analysis is required to develop the right fare structure (Goddard 2012).

Case Study 6 Non-motorised urban transport in Kenya and Tanzania

In Tanzania and Kenya, the Integrated Road Project and the Urban Sector Road Programme included a pilot project to integrate non-motorised transport (NMT). The pilot project included pedestrian and cycle tracks, raised zebra crossings, minibus stops and open drains to separate motor vehicles from NMT. One walkway improvement resulted in a cost/benefit ratio of 3:4 as pedestrians could walk faster. New bicycle lanes saw an initial 12 percent increase in the number of cyclists, which rose to 100 percent with a new bridge across a river. However, an increase in pedestrians eventually drove cyclists off the cycle lanes and back to the roads, and stemmed the increase in cycling because cyclists became concerned about safety.

Source: Pendakur V.S. (2005) *Non-Motorized Transport in African Cities, Lessons from Experience in Kenya and Tanzania', Sub-Saharan Africa Transport Policy Program (SSATP) Working Paper No. 80*. World Bank

e. Local content

Increasing the input of local labour and materials (local content) in the delivery of major transport projects can spur domestic economic growth, and directly and indirectly benefit the poor. Sourcing materials, components and equipment locally can create opportunities for local suppliers and indirectly benefit the poor by generating employment in these supply companies. Local sourcing can be achieved by either specifying that the contractor has to purchase locally sourced materials or that the client can purchase materials directly and engage contractors on labour-only basis (Wells & Hawkins 2008).

Adopting labour-based techniques for road construction can help to maximise employment opportunities for the poor. A study by Keddeman (1998) of numerous low-income and low-wage economies found that labour-based techniques were 25 to 30 percent cheaper than

capital-intensive techniques, and created up to five times the employment for the same investment.

The appropriateness of labour-based approaches to road construction depends on a wide range of considerations but, in particular, on the type of road to be constructed and the traffic the road is intended to carry. Sometimes, sparse local populations or large distances between population centres make labour-based approaches inappropriate. The employment effects of shifting to locally produced materials have also been found to be considerable (Keddeman 1998), although, as with labour-based methods, any specifications that limit a contractor's freedom may make tenders more expensive.

Labour-based construction is often appropriate for community roads built by communities in exchange for food or cash transfers. The DFID Rural Access Project in Nepal, which selects road building groups from among the poorest in the community, is a good example. Governments and donors have to consider the trade-offs. The number of jobs involved in labour-intensive approaches and the benefits to the community these jobs bring have to be weighed against higher maintenance costs over the lifespan of the road. The maintenance costs of community-built roads are usually more than for capital-intensive roads because labour-intensive approaches use lower quality materials in construction.

Other measures that boost employment of the poor include reserving jobs for particular groups, such as women. For example, Kenyan and Tanzanian policies stipulate that 30 percent and 25 percent respectively of construction workers employed on road building schemes should be women (AfDB 2007 and 2011).

f. Road safety measures

Integrating road safety as an integral part of the design of road improvement schemes can reduce accidents and can increase accessibility for the poor. Several of the non-motorised transport measures mentioned in case study 8, such as separate pedestrian and cycle tracks, raised zebra crossings, open drains and separating motor vehicles from pedestrians also help to reduce accidents (Pendakur 2005). Consulting the poor and having them participate in decision making on road safety measures is essential to prioritise their concerns and avoid costly mistakes.

g. Consulting women

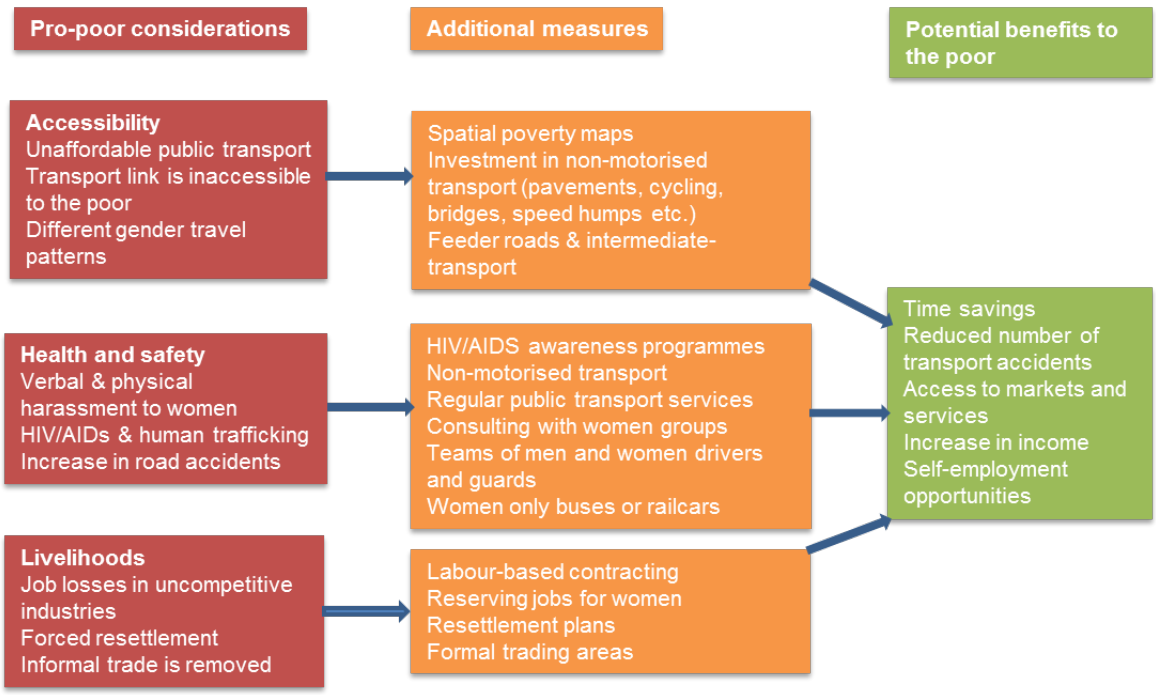
In addition, having women participate in consultations can help to identify safety and security issues (World Bank 2010). For example, consultations with women's groups in Liaoning, China found that poor lighting, infrequent bus services, and a lack of pavements and crossings were key issues for women travellers. The project design was adapted to improve secondary roads, traffic management, pavements and crossings, public transport services and street lights. Consulting with women in Lima, Peru led to the introduction of teams of male and female drivers and conductors on public transport (DFID 2013).

h. HIV/AIDS programmes

HIV/AIDS programmes must be included in World Bank road projects. Contractors must arrange for their employees and their sub-contractors' employees to take part in HIV awareness programmes. Contractors must also take action to reduce the risk of HIV transmission between and among their personnel and the local community (World Bank 2009). The World Bank provides a comprehensive guide to addressing HIV/AIDS that stresses the importance of targeting particularly vulnerable groups such as truck drivers and sex workers (ibid.).

Figure 3 summarises pro-poor considerations in the transport sector and additional measures that can be taken to deliver potential benefits to the poor.

Figure 3 Pro-poor design considerations, additional measures to benefit the poor and the potential benefits in the transport sector



3.3 Information and communication technology (ICT) infrastructure

Improving the poor's access to ICT creates benefits by providing employment opportunities, improving livelihoods, providing better access to finance and bringing positive changes in day-to-day life.

3.3.1 Potential benefits

Evidence suggests that improved ICTs create jobs both directly, in the construction, operation and maintenance of ICTs, and also indirectly through economic growth stimulated by ICTs (IFC 2013). Making access to the internet widely available can also raise the productivity of local businesses in low-income countries, which in turn creates jobs and indirectly benefits the poor. The IFC (2013) estimates that businesses with email and a website boost local employment by 2 to 3 percent a year.

Access to computers can also directly improve the quality, efficiency and accessibility of health care services for the poor. For example, the India Health Care Delivery Programme provides nurses with handheld computers to collect data from rural patients on population growth, birth and immunisation rates. The nurses also administer immunisation and provide advice on family planning. It is estimated that each nurse serves up to 5,000 people in rural areas (Cecchini & Scott 2003).

Direct benefits for the poor from the use of mobile phones include more employment, better livelihoods, stronger social networks, better time-management (e.g. because better information on market prices saves wasted journeys), and improved welfare and security (IFC 2012). For example, full mobile phone coverage increased employment by 15 percent in rural villages in South Africa (IFC 2013) mostly because it created more opportunities for women without child-care responsibilities (Klonner et al. 2008). Sife et al. (2010) examined the contribution of mobile phones to rural livelihoods and poverty reduction in Morogoro,

Tanzania, and found that access to reliable coverage improved local people's ability to deal with emergencies, cut down their travel costs, reduced the cost of doing local business and diversified their livelihood strategies. The use of mobile phones by fishermen in Kerala was estimated to have increased fishermen's profits by 8 percent, reduced consumer prices by 4 percent and improved consumer surpluses by 6 percent (Aker & Mbiti, 2010).

Mobile networks have also directly benefitted the poor by improving access to finance. Through the Kenyan mobile money programme M-Pesa, users can purchase airtime, transfer money and pay bills (ibid.). By September 2009, over 8.5 million Kenyans had registered to use the service and USD3.7 billion (equivalent to 10% of Kenya's GDP) had been transferred over the system since inception (ibid.).

3.3.2 Pro-poor design considerations

a. Limited rural availability of mobile telephone and internet services

Several studies indicate that there is a large gap between ICT services in urban areas and ICT services in rural areas (Fong 2009; GMSA 2013). A recent study by GMSA Intelligence of several markets in East Africa found that the average coverage rate of ICT services was 75 percent but that 96 percent of those not covered live in rural areas (GMSA 2013). Although mobile penetration varies throughout sub-Sahara Africa (e.g. Ghana 50%, Kenya 31% and Niger 20%), evidence from GMSA suggests that the potential for significant growth of mobile use in Africa lies in improving network coverage in remote and rural areas.

Access to the internet is even more limited. Fixed landlines in Africa are largely restricted to the towns, correlating with limited broadband access via ADSL (ITU 2009). The IEG (2011) evaluation supports this, pointing to gaps in access to mobile telephony, high-speed internet and broadband connections in remote areas and for the poorest people. Factors such as lack of electricity and low road densities make installing mobile and ICT networks expensive (Buys et al. 2009; GMSA 2013).

b. High cost of accessing and using mobile and internet services

ICT providers bear the heavy costs of 'passive infrastructure' (non-electronic infrastructure such as towers, power supply). They pass costs on to final consumers as high prices. Or, they may limit availability. This means that mobile users in sub-Saharan Africa spend on average 15 percent of their income on mobile services compared to 3–5 percent in other developing markets (GMSA 2013). People living in rural and less developed areas have little willingness to pay for ICTs. The poorest quintile in Chile is willing to spend only 2–3 percent of their income on communication (Kenny 2002). Assuming that the same holds true for the poorest quintile in low-income countries, this suggests a willingness to pay a maximum of approximately USD10 per year (Kenny 2002). This is far below the cost of the technology needed to connect to the internet.

c. Social exclusion

Even if ICT reaches rural areas and is affordable, there is no guarantee that the poor will use it. Many of the projects that provide access to the internet in rural India, for example, still favour middle and upper class men. Restricted mobility, lack of education and, in some cases, male control over information and media tend to exclude rural women (Cecchini & Scott 2003). The poor also cannot benefit from access to the internet if they are illiterate (ibid.).

3.3.3 Additional measures to enhance direct benefits

a. Measures to improve access

Universal access funds (UAFs) are an example of a regulatory mechanism that can help extend access to ICT facilities through government subsidies (Cecchini & Scott 2003). In Chile, for example, a universal access fund leveraged USD40 million in private investment from just over USD2 million of public subsidy, and significantly increased internet access across the country (ibid.; IEG 2011). A UAF in Pakistan awarded subsidies to increase mobile access to remote villages as well as to extend the fibre-backbone across provinces (ibid.). Despite these successes, IEG (2008) found that targeted efforts by the World Bank Group to extend access beyond commercially viable areas have been largely unsuccessful.

A promising approach to reducing the cost of installation in previously unserved areas – and also to reduce prices for consumers – is to encourage mobile service providers to share passive infrastructure (ITU 2009). However, this trend is relatively recent and evaluation of such approaches in developing countries is hard to find.

Those who cannot afford to connect to a service can be provided with access without any up-front payment through public call offices (PCOs) or village phone operators (VPOs). Helping poor or marginalised women to set up VPOs provides them with income, while delivering a service to the community. The Village Phone Programme in Nigeria, for example, provided micro-credit to women to run VPO services in their villages (IEG 2011). The micro-credit loans enabled them to buy specially designed cell phone kits and airtime at wholesale prices. The number of subscribers rose from 1.1 million in 2003 to 23 million in 2009. The programme is estimated to have covered 55,000 villages. In some countries village 'telekiosks' provide the poor with access to the internet (Case Study 7).

Case Study 7 Telekiosks in India

Since January 2000, Gyandoot – a government-owned computer network – has set up village telekiosks in the poor, drought-prone Dhar district of Madhya Pradesh, India. Gyandoot reduces the time and money people spend trying to communicate with public officials and provides immediate, transparent access to local government data and documentation. For a minimal fee, telekiosks provide caste, income and domicile certificates. This means villagers avoid the common practice of paying bribes. The telekiosks also allow farmers to track crop prices in the region's wholesale markets and negotiate good terms. Other telekiosk services include providing school results and access to the list of people below the poverty line, and a public complaint line for reporting broken irrigation pumps, unfair prices, absentee teachers and other problems (Cecchini & Scott 2003).

Sources: Bhatnagar S. and Vyas N. (2001) *Gyandoot: Community-Owned Rural Internet Kiosks*. World Bank: Washington, DC; Cecchini S. (2002), *Back to Office Report: Evaluation of Gyandoot and Bhoomi and International Conferences on ICT for Development*, Mimeo, World Bank: Washington, DC.

b. Measures to reduce the price of services

Evidence suggests that regulators can widen ICT coverage and lower prices by opening ICT markets to a number of operators. In Kenya, for example, Safaricom has reacted to increased competition by reducing call charges by up to 70 percent for intra-Safaricom calls and up to 40 percent for calls to other networks (ITU 2009). Reducing the taxes on ICT technology and services can also lower prices. There is evidence that taxes on mobile handsets, subscriptions and airtime have had a significant impact on mobile penetration. The International Telecommunications Union (ITU 2009) reports that a 1 percent reduction in

overall taxes could lead to an average increase in penetration of mobile phone usage of 0.5 percent.

c. Consumer applications, information and training

Once the poor have access to ICT, providing them with information and training can make them aware of the availability and potential benefits they could get from ICT services. However, information has to be communicated in languages and in a format that the poor understand (e.g. local languages, posters or pictures).

For example, there is evidence that access to mobile coverage and basic mobile phones, coupled with literacy classes, can increase literacy among adults in Africa (Aker & Mbiti 2010). Specific applications can help effective use of ICT. In agriculture, for example, Case Study 8 illustrates the potential efficiency improvements ICT can generate in rural milk production centres.

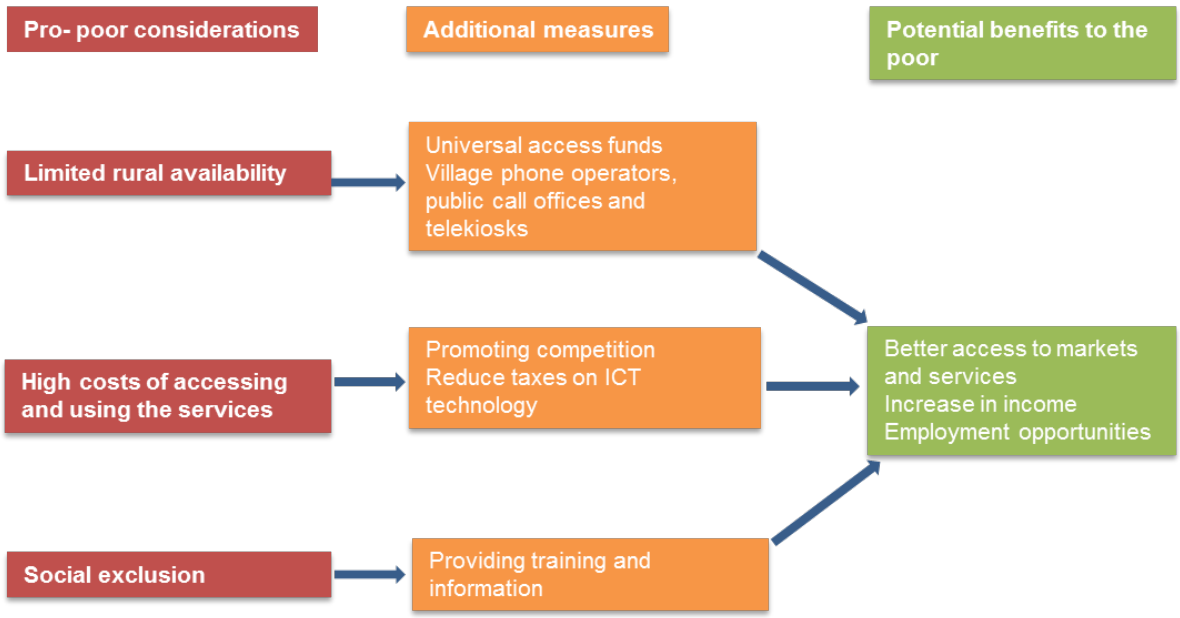
Case Study 8 ICT improves milk production in India

In Gujarat, computerised milk collection centres with integrated electronic weights, electronic fat testing machines and plastic card readers are ensuring fair prices for farmers who sell milk to dairy cooperatives. Traditionally, cooperatives calculated the fat content in milk through a cumbersome measurement process hours after they received the milk. Although farmers delivered milk every day, they only received payment every ten days and had to trust the manual calculations of cooperative society staff. Computerised milk collection centres have increased transparency, led to faster processing, shorter queues and immediate payments to farmers (Cecchini & Scott 2003).

Source: Bhatnagar, S. (2000), *Empowering Dairy Farmers through a Dairy Information and Services Kiosk*. World Bank, Washington, DC.

Figure 4 summarises the pro–poor considerations, additional measures and the potential benefits to the poor for ICT infrastructure projects.

Figure 4 Pro-poor design considerations, additional measures to benefit the poor and the potential benefits in the ICT sector



3.4 Irrigation

3.4.1 Potential benefits

Most of the evaluations of irrigation projects we examined reported significant direct benefits for the poor. Irrigation enhanced incomes by allowing more intensive cropping, delivering higher yields and enabling farmers to grow profitable water-intensive cash crops. Wages for agricultural workers also increased as project beneficiaries hired more agricultural workers. The long-term effects on poverty were even greater as farmers became less vulnerable to rainfall shocks (which undermine the asset base). Evaluation of an irrigation project in Sri Lanka found that the availability of water throughout the year may also enhance household access to credit, which in turn contributes to a further reduction in transient poverty (Sawada 2010).

While the better-off and those that own land enjoy the greatest returns, there are also significant direct benefits for those further down the income scale. An evaluation of irrigation projects in Andhra Pradesh, India (IEG 2008), found that the largest absolute increase in income goes to the top wealth quartile but the greatest growth in income accrues to the second quartile. The poorest quartile gained the least but still enjoyed a growth in income of about 20 percent. The poorest also benefitted in a project in Peru; per capita output, income and profit all increased for farming households below the national poverty line (IEG 2010). The landless benefitted from an increase in wages and from more demand for labour.

3.4.2 Pro-poor design considerations

a. Adverse effects on livelihoods and settlements

Two evaluations of large-scale irrigation projects in India (IEG 2008; Duflo & Pande 2005) concluded that projects can have adverse environmental and social impacts. Thus, the economic gains may be at the cost of making some groups worse off. An evaluation of dams in India (Duflo & Pande 2005) found that the winners were located downstream of the dam (the command area) and the losers in the vicinity and upstream of the dam (the catchment area). Agricultural production increased and poverty declined in the districts downstream but poverty and vulnerability to rainfall shocks increased in the catchment area. The authors concluded that the construction of large dams had in aggregate increased poverty. While, in principle, the aggregate gains could be used to compensate those who lose land and livelihood, this frequently did not happen in India. The evidence suggests that adequate compensation depends on the political power and organisational abilities of displaced populations.

b. Low returns

A further challenge is that large-scale irrigation projects have usually yielded low returns. The evaluations mentioned above found that projects were only marginally cost effective[7]: 1 percent in the case of dams (Duflo & Pande 2005) and only 2 percent in the Andhra Pradesh irrigation projects (IEG 2008). Projects in Andhra Pradesh delivered low returns because of cost overruns and construction delays, as well as the failure to realise the expected income gains. This confirms our assumption that serious delays in construction postpone the realisation of benefits and reduce the economic rate of return (ERR). 'For large-scale irrigation projects to appear economically attractive they must be able to be constructed on time or in a manner that allows benefits to be phased in at an earlier stage' (IEG 2008).

[7] Cost-effective means that economic returns exceed the whole-life cost (design, construction, operations and maintenance) of the built asset.

It is also essential that assessments of potential benefits are realistic and that they include all benefits and costs – especially realistic re-settlement costs, adverse environmental impacts and the negative effects on those deprived of water elsewhere. Given that the dams in India evaluated by Duflo and Pande (2005) were only marginally cost effective, including the true costs of compensation would have rendered them uneconomic. The authors suggest that omitting redistribution costs may well have been necessary to secure political backing for these dams.

Due to the low returns on irrigation projects, the World Bank has switched from supporting new construction to supporting rehabilitation and policy reform. In fragile and conflict-affected states (FCAS), where there are relatively high risks associated with constructing new large-scale irrigation infrastructure, rehabilitating irrigation schemes which have been damaged by conflict or neglect and completing partially-built schemes can provide significant short-term benefits (Jones & Howarth 2012). But the significant, potentially positive impact of irrigation on rural poverty suggests that new schemes may also be justified if the issue of low returns can be addressed.

c. Inappropriate pricing policies

Inappropriate pricing policies present a further risk to the economic viability and sustainability of irrigation schemes, as well as to equity. Pricing policies in Andhra Pradesh and Armenia encourage water wastage and fail to bring in sufficient funds for maintenance. IEG (2008) suggests that the current pricing policy in Andhra Pradesh also provides farmers who are not among the poorest – or even among the poor – with a sizeable subsidy. The authors argue that that because farmers' incomes increase as a direct result of irrigation there is the potential to recover the full recurrent costs from them.

3.4.3 Additional measures to enhance direct benefits

Evaluations of irrigation projects indicate a number of additional measures that can be taken to address risks and increase the direct benefits of irrigation for the poor (Figure 5). The additional measures shown in Figure 5 do not include mitigating the risk of low returns (e.g. from construction delays), which would require improvements in the enabling environment. Measures also do not include compensation for re-settlement of people affected by the construction of irrigation facilities or compensation to support recovery of their income and livelihood. These considerations should be an essential component of any project. IFI has automatic safeguards to consider these issues.

a. Support to water user associations (WUAs)

Water user associations can help manage water use in irrigation projects effectively. WUAs in a multi-component project in Peru created a culture of respect and compliance with the irrigation distribution schedule. This helped to ensure that the fees collected were used to operate and maintain water infrastructure, and to raise awareness among water users of the importance of this revenue for further developing and maintaining water facilities (IEG 2010). However, the evidence on the effect of involving WUAs in the project was largely qualitative and mixed; approximately 60 percent of respondents detected little improvement in the operation and management of their WUA (ibid.).

The findings from an evaluation of an irrigation project in Andhra Pradesh suggest that WUAs have not always lived up to expectations. WUAs lacked ways to enforce equitable water distribution and payment of fees for water use, and did not fulfil their operation and maintenance roles (IEG 2008). The authors concluded that WUAs are not a panacea and that 'increasing the efficiency of irrigation departments is a necessary starting point for profitable investments' (ibid.). The performance of WUAs also fell short of expectations in an irrigation project supported by the US Millennium Challenge Corporation (MCC) in Armenia (de Brauw 2012).

b. Agricultural extension services

The project in Peru found that subsidising modern irrigation equipment and providing on-farm training as part an agricultural extension service was very effective. Productivity increased by more than 20 percent and the proportion of production sold in the market increased by 12 percent. The production of export crops also experienced a boom. The evaluation results suggest that the extension service may have had the greatest impact on poor farmers who tended to specialise in staple crops but increased cultivation of permanent crops, leading to a 10 percent increase in market sales (IEG 2010).

Farmers who benefitted from on-farm training in modern irrigation technology saw an increase of 7 percent in the value of their total agricultural production (ibid.). There was also some qualitative evidence of spillover effects from investments in irrigation technology and extension services on farming outcomes in the locality – in particular a shift towards export and industrial crops and increased sales in local markets. Some of the spillover effects took the form of more demand for labour and new work opportunities (ibid.).

Projects with several components are common in the irrigation sector. The rationale for multi-component projects is that there are complementarities and synergies between the subcomponents. While there is strong evidence of synergies, careful evaluation is required as negative externalities may also occur. The evaluation of the project in Peru found that combining extension services and infrastructure rehabilitation had some negative effects on production. Although the reason for this counter-intuitive finding is unclear, a possible explanation is that, in adopting new farming techniques, farmers used more water, and water use exceeded the water supply (IEG 2010).

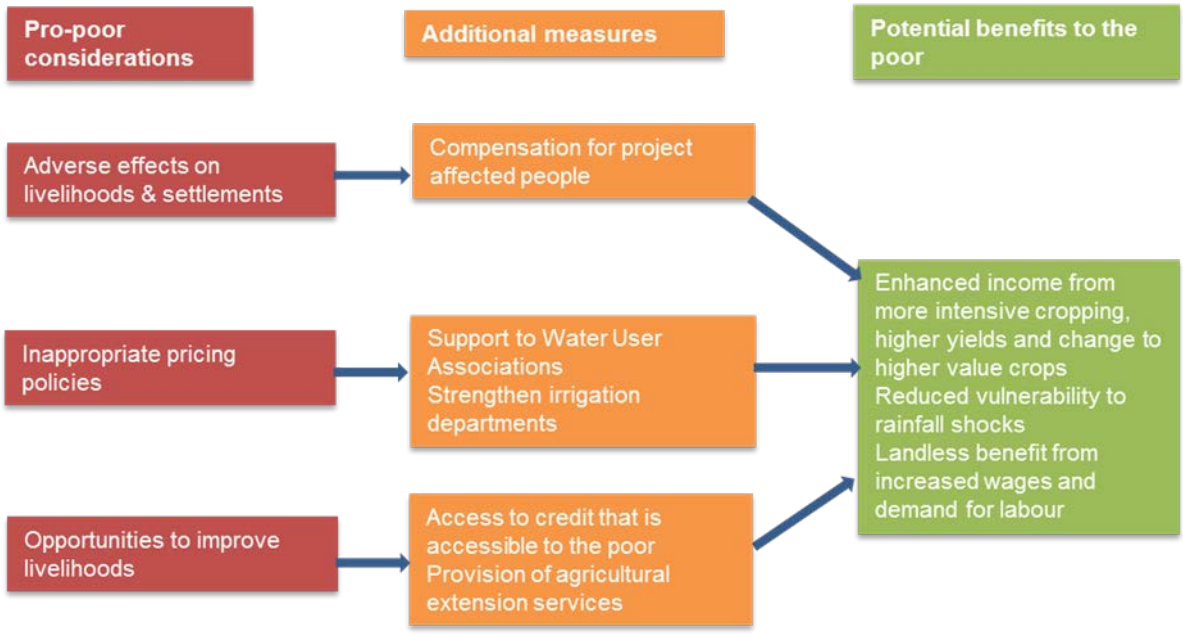
Training was also part of the irrigation project in Armenia. A longitudinal survey of farming households before and after training, found some modest impacts on soil preparation and use of pesticides, but no impact on what farmers grew or the techniques they used. One of the main problems the evaluation report identified was that incentives did not encourage farmers to save water. Water was billed by the amount of land and the crops irrigated, rather than the amount of water used. Another factor was that farmers may not have had access to credit to invest in advanced irrigation techniques. Despite this, the market value of three high-value crops did increase, raising agricultural profits by about 18 percent in the mountainous regions (de Brauw 2012).

c. Access to credit

The project in Armenia created a pool of USD8.5 million to be made available to farmers at low rates of interest. The objective was to catalyse agricultural investment by farmers who took part in training activities. This sub-component of the project was very popular and, by 2011, loans had been made to 1000 farmers. The author concluded that credit plays an important role in the economy and will continue to serve new farmers far into the future. However, the household heads who received credit appeared to have higher education levels and to be wealthier. In this context, credit is only likely to be an effective anti-poverty measure if efforts are made to ensure that it reaches poorer households.

Figure 5 summarises the pro-poor design considerations, additional measures and the potential benefits to the poor of the irrigation infrastructure.

Figure 5 Pro-poor design considerations, additional measures to benefit the poor and the potential benefits in the irrigation sector



SECTION 4

Infrastructure associated with extractives

This section focuses on 'associated infrastructure' in the extractives industry. Associated infrastructure refers to the secondary infrastructure that supports the core operations of extractive industries. This includes transport (rail and roads) for facilitating access to ports and export sites, and power and water for core production processes. Capital infrastructure, the physical or core assets required for core operations (drilling rigs, production platforms etc.) are excluded. There are clear overlaps with the other sectors covered in this guide (energy, ICT, irrigation and transport) and this section will not revisit issues already addressed. Instead, we address the broader programmatic impacts from associated infrastructure packages that provide services principally for extractives operations.

The literature reviewed in this section suggests that without 'additional' measures the poor generally do not derive significant benefits from associated infrastructure in the extractives sector (Morris et al. 2011; DFID 2011; Byiers 2013; Ross 2007; Ross 2001). Where benefits exist, they tend to be indirect (e.g. from general growth in gross national product) or highly localised. This is because delivering benefits to the poor from associated infrastructure in the extractives sector presents specific challenges.

4.1 Sector characteristics

The extractives industry is characterised by long periods of risky and often costly capital-intensive exploration and development, which require sophisticated management and specialised technology[8] (EI Sourcebook 2014). Typically, most developing nations depend on international rather than domestic sources of investment (EI Sourcebook 2014). Information asymmetries are common; host governments tend to be at a disadvantage compared to international investors and operators (Stiglitz 1989; Nutavoot 2004). As a result, the power relationships between states and resource companies[9] are often unequal and influence the design of licences, contract award procedures, fiscal arrangements, and administration and engagement of external technical assistance. This means that host countries are often not fully able to negotiate equitable concession agreements with (private sector) resource companies and/or to include social and environmental development goals as part of contracts or licences.

There are also substantial potential economic rents to be gained from the extractives industry. Generally, resource companies are driven by profits and governments are driven by revenues. Although addressing poverty alleviation and social development can increase the legitimacy of governments and can contribute to the profitability of resource companies (Auld et al. 2008; Gardberg & Fombrun 2006), there is a real risk that resource rents will take priority over development outcomes (Fougère & Solitander 2009). Social development goals may be either included as secondary objectives or left to corporate social responsibility or

8 Pursuing these opportunities demands deep pockets, a diversified economy to minimise investment risks and significant institutional capacity to oversee sector operations (Boadway & Keen 2010).

9 The term 'resource companies' refers to private sector companies involved in exploration, development and production of resources in the oil, gas, mining or other extractive industries. In this context, it generally does not apply to companies that purely invest in or provide consultancy, advice or other such services to resource companies.

other voluntary programmes. This underscores the importance of political leadership, and legal and fiscal regimes in resource exploitation that capture social and environmental goals.

The extractives sector is widely referred to as the 'enclave economy'[10] (Larsen et al. 2009; Morris et al. 2011; Bloch & Owusu 2011; EI Sourcebook 2014) as it tends to lack productive backward and forward links to the wider economy. This is largely due to the associated infrastructure requirements of the extractives industry, specifically the need for major transport links from extraction sites to ports and export facilities (Farooki 2012). Extraction sites are usually in remote locations (particularly in Africa) and production is generally destined for export. Usually, dedicated transport networks have to be built to service these point-to-point needs. However, on their own, these transport links are unlikely to service wider developmental needs effectively. Inputs to the extractive sector (chemicals, machinery and personnel) are generally also imported (Farooki 2012). The nature of many commodity sectors confines the benefits of exploitation to a very narrow segment of society (Morris et al. 2011) and delivers only limited benefits to the poor (DFID 2011). Any benefits to the poor arise indirectly, as a result of taxes and export revenues and enhanced infrastructure in the extraction areas (Bloch & Owusu 2011).

The private sector is the main driver of infrastructure development in the extractives industry (Gardberg & Fombrun 2006; Fougère & Solitander 2009), albeit in partnership with governments. Infrastructure development generally aims to service 'private' industry needs. Given that development of public infrastructure ordinarily falls outside the scope of resource companies (EI Sourcebook 2010), they may lack the expertise required to deliver assets with public benefits (Frynas 2008). Unequal power relationships, information asymmetries, limited government capacity and expertise, as well as motivations for resource exploitation make mandating the delivery of public goods by resource companies highly complex.

4.2 Additional measures to enhance direct benefits

The characteristics of the extractive sector mean that in order to ensure that the poor benefit from investments in infrastructure associated with extractive industries, additional measures and special interventions are required.

a. Leveraging private sector investment to benefit communities

Partnering[11] between resource companies and governments could help leverage existing or planned private sector investment in associated infrastructure to deliver mutual benefits and benefits to the wider community (IPIECA 2006; McPhail 2000; World Bank 2013). Partnerships enable resource companies to contribute to social development goals outside their area of expertise. At the same time, resource companies are able to offer know how and skills to help public partners develop and implement (social) projects. Such partnerships share costs, benefits, risks and liabilities. They also enhance the legitimacy of resource companies by demonstrating that they provide social and environmental goods beyond their core business operations and over and above legal compliance requirements (IPIECA 2006). For example, companies could supply surplus energy or water from auxiliary mine infrastructure to local communities and farms.

10 An 'enclave economy' is an isolated economy without forward and backward economic links, e.g. an agrarian economy which imports its tractors and fertilisers, and exports its products. In such economies, an economic activity does not have any spinoffs in terms of services and processing and so the dynamic effects of inter-sectoral growth are absent (Bloch & Owusu 2011).

11 Partnering initiatives/partnerships refer to multi-stakeholder groups cooperating and working together within the extractives sector to deliver mutual benefits and overcome sector challenges. Each partnership is unique, shaped by the demands of the common task and by the individual needs of the partners (IPIECA 2006).

One option for securing these types of direct pro-poor benefits is to include specific social development goals or public infrastructure development and maintenance targets as part of contract or licence conditions (EI Sourcebook 2010). Social or environmental obligations should be clear and enforceable. In Papua New Guinea, for example, the government included a requirement for a company to provide electricity to local communities in a mining contract. However, the conditions were ambiguous and open to interpretation, and reduced the effectiveness of the contractual agreement (Columbia University 2012).

A further example of a strategic partnership to deliver benefits to the poor is the Global Gas Flaring Reduction Partnership (GGFR). The GGFR is a partnership of governments of oil-producing countries and oil companies (both state-owned and international oil companies) that supports national efforts to reduce flaring while delivering wider benefits to the community. GGFR enables local communities to use natural gas and liquefied petroleum gas (LPG) that would otherwise be flared. Results from programmes in Ecuador and Chad indicate that on a small or medium scale, flare gas could be used sustainably and could add important environmental, social, and wider developmental benefits to a developing country oil project, without jeopardizing financial viability (World Bank 2004).

There is no single template for successful partnerships. Approaches to partnership are highly context-dependent (Case Studies 9 and 10).

Case Study 9 Powering local communities in Afghanistan

In 2007, the Chinese government-owned companies China Metallurgical Group Corporation (MCC) and Jiangxi Copper Corporation (JCC) won exclusive rights to mine the Mes Aynak copper deposit in Afghanistan for 30 years. As part of the concession to develop the copper mine, MCC-JCC will finance and build a 400 MW power plant at a cost of USD500 million. Electricity generated from the plant will power the mine. Part of the surplus (100-200 MW) will be provided to Afghanistan at a cost to be determined under a power purchase agreement. Impact assessment and evaluations are not yet available. Production (both mine and power) will start in 2016 or 2017 (World Bank 2013). However, there are concerns about the environmental and social impacts of this project.

Sources: Huffman, B. (2013) 'The Fate of Mes Aynak: An ancient Buddhist city is caught in a drawn-out battle between commerce and culture in Afghanistan', *The Tricycle, Spring 2013*; Synovitz, R. (2014) 'Afghanistan: China's Winning Bid For Copper Rights Includes Power Plant', *Railroad, Radio Free Europe Radio Liberty (RFERL), Monday 27 January 2014*

Case Study 10 Expanding a water pipeline network in Egypt

Egyptian LNG (ELNG), a liquefied natural gas (LNG) company, which operates in the Egyptian governorate of Behera, required a secure and reliable source of clean water for production, domestic utilities and fire emergencies. However, the volume of water required was not available onsite and it was not feasible for ELNG to pursue private options (e.g. groundwater extraction or wastewater treatment) to supply its water needs. A partnering initiative with Behera Water and Drainage Company (BWADC), the municipal water company, supplies ELNG's water needs and improves water supplies to nearby towns and villages. After extensive negotiations, which included the governorate of Behera, ELNG funded the full USD4.8 million cost of the project, while BWADC supplied engineering and construction workers, machinery and permits, as well as ongoing maintenance of the pipe. This partnership provides direct benefits to nearby towns and villages, increasing the water supply by 50 percent and benefitting 405,200 end users.

Source: IPIECA (2006) Partnerships in the Oil and Gas Sector

b. Incentivising corporate responsibility and voluntary action

Corporate responsibility[12] (CR) is a concept whereby companies voluntarily integrate social and environmental concerns into their business operations and their interactions with their stakeholders (Fougère & Solitander 2009; EU Commission 2006). Many companies now align good CR with corporate profitability. CR programmes have been compared to investment in R&D. CR creates intangible assets and is a key component of a cycle through which companies reinforce their legitimacy and competitive advantage (Gardberg & Fombrun 2006). Infrastructure related CR programmes tend to focus on micro-projects and local benefits, for example building a local hospital, school or community hall (Idemudia 2011; Frynas 2008). For example, in a recent development in Georgia, BP rehabilitated nine rural infrastructure projects in order to support local enterprise development. The infrastructure linked at least 150 farmers and producers (30% women) to urban markets for their products (BP Georgia Sustainability Report 2012). Case Study 11 provides a further example.

Case Study 11 Shell community investment lights up Nigerian homes

Uninterrupted power allows local businesses and communities to develop. Shell helped set up a local utility company to supply affordable, reliable, clean electricity to the community near the Bonny Island LNG plant in the Niger Delta. Power generated by gas turbines at the plant supplies a grid that serves businesses and homes in the area, directly benefitting around 75,000 people. Locals receive a certain amount of free electricity. Over this threshold, prices are set according to income, making it affordable for all. In addition, the utility company has generated 200 full-time jobs and boosted the local economy.

Source: www.shell.com/global/environment-society/society/social-investment/access-to-energy.html

However, CR does not always neatly align with private sector objectives (Auld et al. 2008). Often, resource companies have to balance exploiting their core competencies to maximise their profits against providing social and environmental goods to boost their legitimacy (Frynas 2008; Gardberg & Fombrun 2006; Fougère & Solitander 2009).As with all CR, resource companies require a strong business case for investing in infrastructure that delivers benefits to the poor(Fougère & Solitander 2009).).

c. Resource corridors

For the purposes of this guide, we define a development corridor (DC) as a combination of infrastructure and other interventions to encourage growth and develop backward and forward linkages to deliver socio-economic benefits. DCs focused on extractives are also known as resource corridors[13] (RCs).

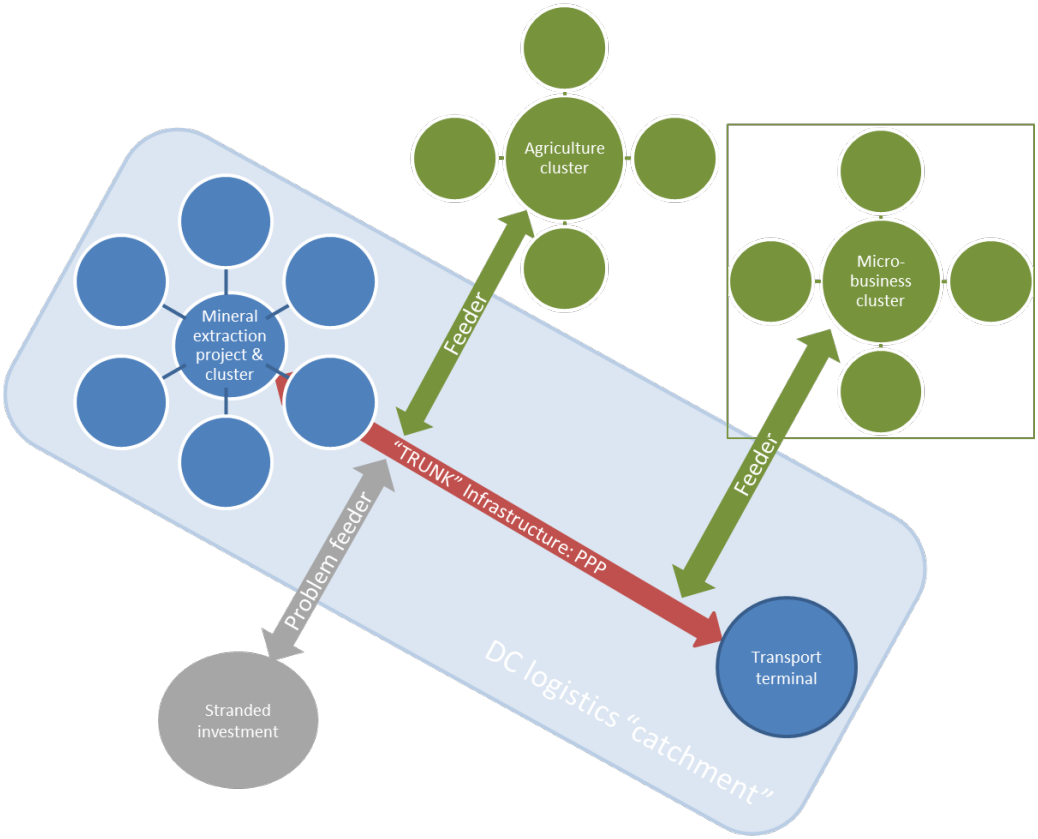
[12] Although the term corporate social responsibility (CSR) is more commonly used than the term corporate responsibility CR, the latter conveys better the responsibility for both social and environmental issues (Fougère & Solitander 2009). Given the nature of the extractives industries and the potential for significant environmental impacts, which in turn have implications on poverty, we have opted to use CR instead of CSR throughout this paper.

[13] In the literature reviewed, the term 'resource corridor' is often used inter-changeably with 'growth corridor', 'development corridor' or 'spatial development initiative'. Although these terms can apply to general transport infrastructure, they are used in this context to refer specifically to a programme of activities and interventions designed to leverage large-scale minerals/extractives/resource sector investments to achieve wider economic and social benefits.

An approach to RCs which has been used in Africa is the spatial development initiative (SDI)[14]. SDI approaches promote inter-related infrastructure and large-scale resource sector investments (anchor projects and clusters) in order to realise the latent investment potential in DC 'catchment' areas (EI Sourcebook 2012).

Figure 6 illustrates a resource corridor anchored on a mineral project/cluster with interventions to maximise linkages in other resource sectors (agriculture, forestry, fisheries) and in local enterprises.

Figure 6 Idealised spatial development initiative (SDI) configuration (adapted from Jourdan 2011)



RCs aim to foster sustainable industrial development in areas where poverty and unemployment are highest (Campbell & Hauptfleisch 2012) by crowding in investment and public-private partnerships, generating sustainable employment and maximising private sector investment. There are numerous DCs in Africa, some of which can be classified as RCs. The Maputo Development Corridor (MDC) is considered a good example of a functioning corridor (Case Studies 12 and 13).

[14] SDIs are characterised by intensive interventions to fast-track private sector investment, stimulate the growth of small, medium and micro-sized enterprises (SMMEs), and enhance empowerment of local communities.

Case Study 12 Pro-Poor Value Chain Development in the Maputo and Limpopo Corridors (PROSUL)

The PROSUL project was implemented in the MDC and Limpopo Corridor. It aims to deliver improvements in three value chains: horticulture, cassava and red meat. The project will support smallholder production, address key market and biophysical constraints, ensure sustainable access by smallholders to essential services and create a more favourable business environment. Measures include rehabilitation of smallholder farmland, irrigation schemes, promotion of climate-resilient practices, creation of water user and/or meat trader associations and holding cattle fairs, provision of storage and packaging services, provision of funding and micro-finance options. It will reach 20,350 beneficiary households, mostly the economically active poor. Anticipated benefits include:

- 4,800 smallholder farmers (60% women) have access to horticultural markets;
- 200 greenhouses operational benefitting around 200 farmers (50% women);
- At least 8,000 farmers (50% women) accessing support services throughout grower schemes and service hubs;
- 50 percent of participating households adopt mixed cropping practices to ensure food security;
- At least 5,600 breeders (50% women) accessing animal health services; and
- At least 75 percent of participating farmers (50% women) access financial services.

Source: PROSUL Project Report August 2012, International Fund for Agricultural Development (IFAD)

Case Study 13 Maputo Development Corridor

Analysis of the MDC for the period 1996-2002 showed that, in South Africa, total economic output (across sectors) as measured by gross value added (GVA) grew more in areas close to the corridor than in areas further away. In Mpumalanga, the growth rate in employment (15% pa) was well above the South African average (12% pa). The districts of Nelspruit, Witbank, Middleburg and Highveld Ridge located on the N4 corridor became dominant employment centres. The growth rate was also 50 percent higher than in Gauteng, the economic hub of South Africa. Education levels in Mpumalanga rose during the analysis period, but rates of increase in areas close to the corridor and further away were similar. Finally, improvements in human development correlated positively with proximity to the corridor.

The results in Mozambique are less clear due to conflicting data/measurement methods. The data shows that over 65 percent of the 31,000 companies in Mozambique are concentrated in Maputo, Gaza and Sofala provinces, which are situated along the corridor, and that these companies offer significant employment opportunities. Contrary to the national trend, poverty increased by approximately 3.5 percent in Maputo Province and 5.8 percent in Maputo City but there were improvements in the human development index.

Sources: CSIR & CI April (2004) Maputo Development Corridor: First Phase Evaluation; Campbell, M. & Hauptfleisch, A. (2012) 'The impact of the Maputo Development Corridor on wealth creation within the region it serves', *Journal of Civil Engineering and Architecture, Vol. 6, No 9 (Serial No. 58)*, p1184-1193; Schutte, I. (2005) *Maputo Development Corridor, Evaluation of First Phase*, Proceedings of the 24th South African Transport Conference (SATC 2005) Pretoria South Africa.

Effective RCs include provisions for auxiliary infrastructure to enable links (for example feeder roads to link 'stranded' opportunities both within extractives industries and beyond (Figure 6), and in particular to enable links between small, medium and micro enterprises (SMMEs) and the poor. Research on the MDC demonstrates that without targeted and

additional measures in DCs (including upgrading or providing feeder roads to main trunk infrastructure) up to 90 percent of smallholders are unlikely to benefit (Byiers 2013).

Access to infrastructure alone is insufficient to stimulate such linkages, particularly in relation to SMMEs. Evidence suggests that other constraints, such as access to credit, finance or training, and capacity constraints, need to be addressed. In the case of the MDC, forward and side-stream linkages were actively supported and promoted to generate opportunities for SMMEs. For example, numerous capacity-building mechanisms were implemented, including training programmes (Roodt 2008).

Early analysis of the MDC shows that it delivered direct benefits in the form of 710 contracts worth USD35 million, approximately 5,000 permanent, temporary and casual jobs, and training for around 8,500 individuals (Roodt 2008). However, there is wide gap in the distribution of benefits by gender; only 20 percent of the 710 contracts were awarded to women contractors (Roodt 2008). Benefits were limited to the construction stage. It is not clear what additional measures currently exist to maximise outsourcing to local entrepreneurs or to develop links to local enterprise.

d. Local content

Warner (2011) defines local content as the composite value contributed to the national economy from the purchase of bought-in goods and services including wages and benefits, materials, equipment and plant, subcontracts and taxes. Local content provides direct benefits to the poor employed by contractors, suppliers and along supply chains, and indirect benefits, created as employees spend their wages in the wider economy. Local content usually means 'national' content and includes procurement from community-based suppliers and suppliers who source labour or material from local communities, as well as procurement from large, national suppliers.

A robust local content regime can deliver benefits to the poor from extractive industry investments. There is a growing move towards including local content requirements in the procurement processes of oil, gas and mining companies, such as in Brazil, Ghana, Azerbaijan, Angola, Liberia and Kazakhstan (Warner 2011). These requirements aim to create local jobs, promote the development of local enterprises and accelerate the transfer of skills and technologies to local people and businesses.

Local content requirements are usually sufficiently broad to encompass associated infrastructure as well as the construction, maintenance and operations of capital infrastructure such as oil platforms. Although there is little evidence of the effects of local content in associated infrastructure, the lessons from applying local content requirements in capital infrastructure can be useful. For example, analysis by the BG Group of the impact of their expenditure in Trinidad and Tobago showed that Trinidadian nationals worked 99 percent of the 1.1 million hours spent on constructing the 'Poinsettia topsides' within the Poinsettia gas fields in Trinidad. Of the Trinidadian nationals, 27 percent came from the nearby La Brea community and approximately 50 percent from within five miles (Warner 2011).

National legislation, regulations or policy can specify local content. For example, the Nigerian Local Content Act 2010 includes a requirement that any contract with a budget exceeding USD100 million must contain a 'labour clause' mandating a minimum percentage of Nigerian labour (EAP 2013). Alternatively, local content requirements can be included as a clause in agreements between private operators and governments (Warner 2011).

Figure 7 shows the pro-poor design considerations, additional measures and the potential benefits to the poor in the extractives sector.

Figure 7 Characteristics, additional measures to benefit the poor and the potential benefits in the extractives sector

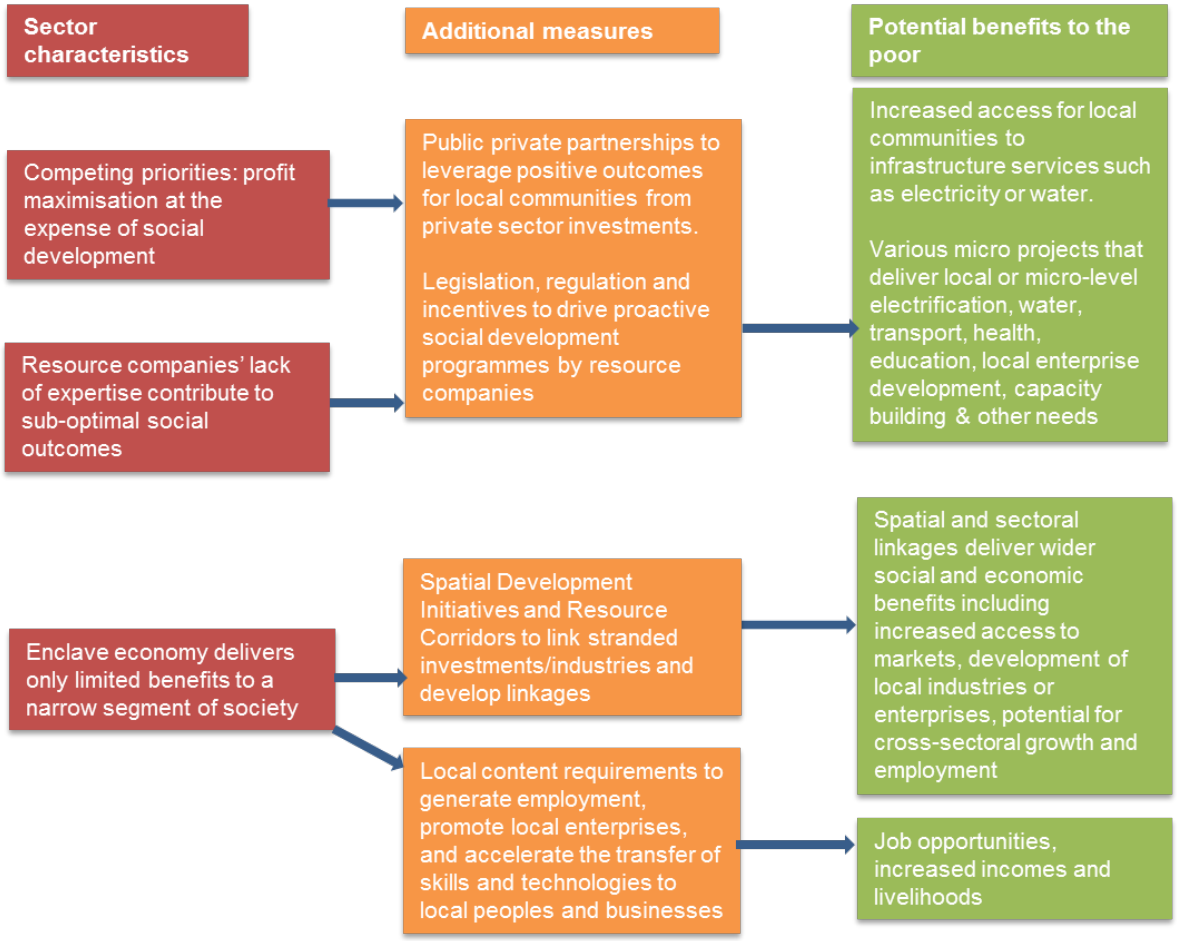
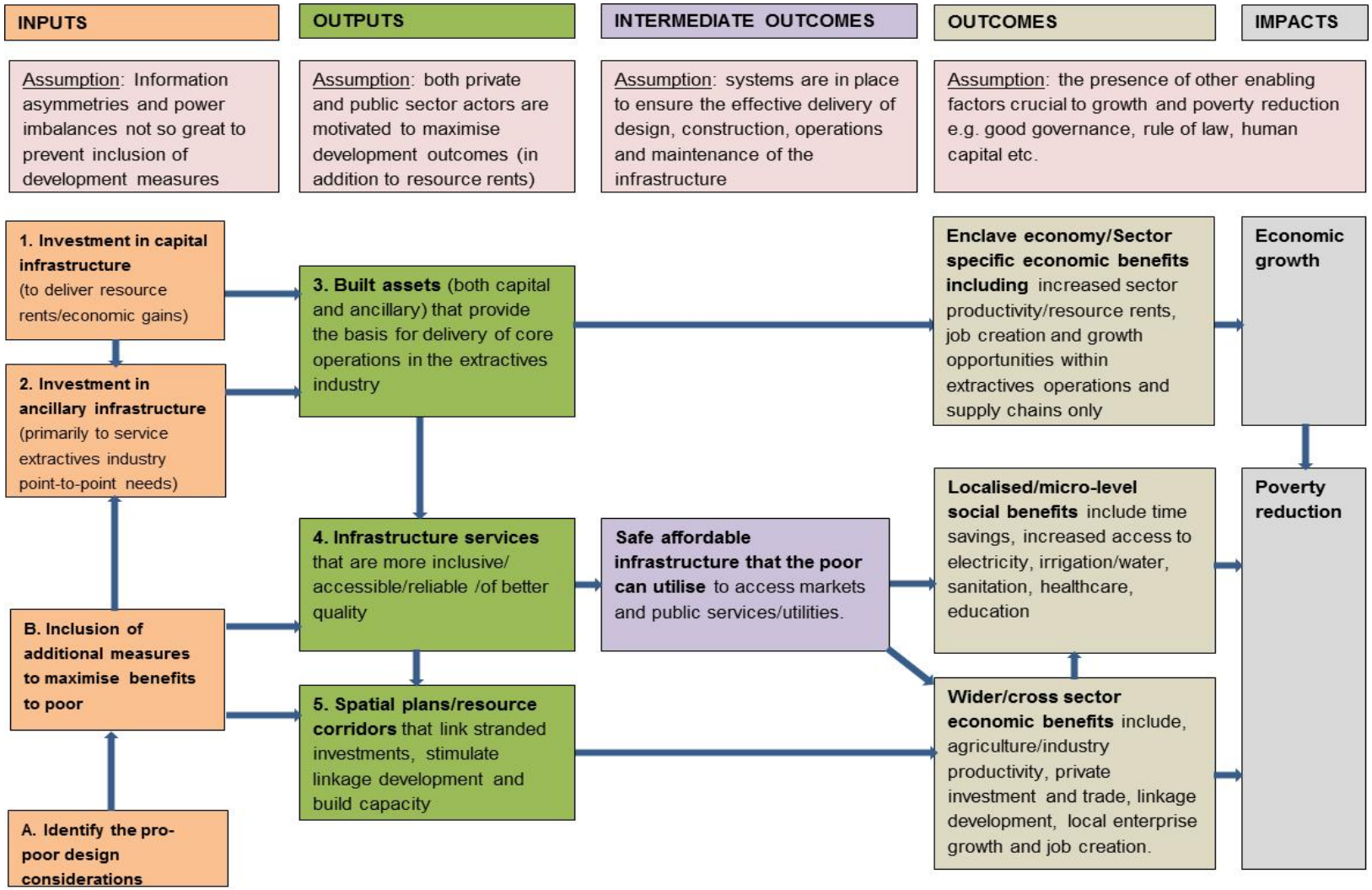


Figure 8 Theory of change for investment in infrastructure associated with extractive operations with additional measures to benefit the poor[15]



15 Figure 8 is based on a theory of change developed by Lily Ryan-Collins, Department for International Development.

SECTION 5

Conclusions

In the conclusions, we draw cross-sector themes based on the evidence in sections 3 and 4. To help us identify these themes we have developed two tables. Table 2 summarises the direct benefits and indirect benefits from each sector where additional measures have not been included in the project design. Table 3 summarises the benefits for the poor when additional measures are included in the project design.[16] By comparing the two tables, we can see how the additional measures can create additional benefits to the poor and enhance any existing benefits. Figure 9 illustrates how the additional measures contribute to the ToC. The differences between Figures 1 and 9 are shown in italics.

5.1 Evidence of direct and indirect benefits to the poor

Investment in economic infrastructure projects can bring both direct and indirect benefits to the poor.

Sector	Direct / Indirect benefits	Benefits					
		Employment opportunities	Increase in incomes	Self-employment	Time savings	Gender	Health or education
Energy	Direct benefits	√	√		√	√	√
	Indirect benefits	√	√				
ICT	Direct benefits	√	√		√		√
	Indirect benefits						
Irrigation	Direct benefits	√	√				
	Indirect benefits						
Transport	Direct benefits	√					
	Indirect benefits	√	√				√

Table 2 Summary of the direct and indirect benefits to the poor without the inclusion of additional measures

Table 2 identifies strong evidence of *direct* benefits to the poor across all sectors particularly relating to job creation and increased incomes. There is limited evidence in the energy and ICT sectors of time savings, benefits to women and children and improvements in health and education.

Indirect benefits identified in Table 2 relate to increases in employment and improvements in livelihoods in the transport and energy sectors as a result of growth in the private sector, arising at least in part as a result of improved infrastructure. Indirect benefits also arise when

[16] Infrastructure associated with the extractives sector has not been included in tables 2 and 3 as the sector characteristics make it harder to draw comparison with the other sectors.

governments invest new revenues derived from infrastructure in public services. There is also limited evidence of localised indirect benefits to the poor from investment in infrastructure associated with extractive operations.

This does not mean that there are no indirect benefits in the ICT and irrigation sectors or fewer indirect benefits than direct benefits, but rather that there are significant methodological challenges to attributing indirect benefits to infrastructure development. The evidence is both weak and thin as indirect benefits are harder to ascertain. Further research is required to better understand and measure the indirect benefits to the poor from investment in large-scale infrastructure projects designed to promote economic growth in specific contexts.

5.2 The enabling environment is crucial

Sections 3 and 4 have shown how crucial the enabling environment (the assumptions in the ToC) is to ensuring that the anticipated economic returns and the benefits to the poor are realised. The evidence shows that the efficiency and speed of construction have a huge impact on the economic rate of return (ERR). In the case of large-scale irrigation projects, we have seen how cost overruns and construction delays postpone the realisation of benefits and reduce the ERR. Thus, "for large-scale projects to appear economically attractive they must be able to be constructed on time, or in a manner that allows benefits to be phased in at an earlier stage" (IEG 2008). Maintenance or lack thereof will also affect returns from the investment. The means for ensuring proper maintenance must be built into the project. The extent to which the potential adverse environmental and social impacts, including transition costs, are properly identified and addressed will also affect returns. Further research is required to understand the transition costs and how they are incorporated into the cost-benefit analysis of infrastructure projects and programmes.

The enabling environment is equally important in the extractives sector as the characteristics of the sector present specific challenges to delivering benefits to the poor. Robust legal, contractual and fiscal regimes, and careful consideration of pro-poor requirements are required to ensure adequate inclusion of social and environmental development goals from the outset.

5.4 Prioritise accessibility and affordability in design

Table 3 shows that the extent to which the poor can benefit directly from infrastructure investment across all sectors depends on accessibility and affordability. When the poor are either unable to access a service, or unable to afford it, the non-poor and the less poor at both community and household levels enjoy the largest share of the benefits. Social issues can also limit the benefits to the poor, especially for women and girls. Even where the poor can afford access, they are often not able to take advantage of the service or use it for productive purposes. For example, illiteracy may prevent the poor from benefitting from internet access, while landlessness may restrict the benefits from irrigation.

Design consideration	Sector	Additional measures	Benefits					
			Employment opportunities	Increase in incomes	Self-employment	Time savings	Gender	Health or education
Access and affordability	Energy	Loans, payments, micro-credit	√	√		√	√	√
		Subsidies for suppliers and off-grid provision	√			√	√	√
	ICT	Promoting competition	√	√				
		Universal access funds	√	√				
		Telekiosks, public call offices / village phone operators	√	√			√	
		Reduce taxes in ICT technology	√	√				
	Irrigation	Support water user associations		√				
	Transport	Spatial poverty maps	√	√	√	√	√	√
		Non-motorised transport	√	√	√	√	√	√
		Feeder roads and Intermediate transport	√	√	√	√	√	√
Adverse effects on livelihoods and settlements	Irrigation	Compensation for project affected people		√				
Health and safety	Transport	HIV awareness					√	√
		Regular public transport services	√	√	√	√	√	√
		Consulting women groups			√		√	√
		Teams of men and women drivers and guards on public transport					√	√
		Women only buses or railcars					√	√
Land tenure	Energy	Building effective public-private-community partnerships	√			√	√	√
Livelihoods	Irrigation	Agricultural extension services		√				
		Access to credit	√	√				
	Transport	Local content	√	√	√		√	
		Formal trading areas	√	√	√		√	
User Productivity	Energy	Consumer information	√			√	√	√
	ICT	Consumer applications, information and training	√	√				
	Irrigation	Strengthen irrigation departments		√				

Table 3 Summary of the benefits to the poor with the inclusion of additional measures

In the extractives sector, the primary objective of associated infrastructure assets is to service the industry's point-to-point needs. Independent of additional measures or special interventions, private developers are unlikely to consider accessibility or affordability for the poor.

5.5 Additional measures can create additional benefits to the poor and enhance existing benefits

Table 3 shows that integrating additional measures into project designs can create additional benefits as well as enhancing existing benefits for the poor. *Accessibility* can be addressed by extending infrastructure so that a larger proportion of the population can access services, for example by building feeder roads to highways, extending electricity grids, investing in mini-grids, providing for non-motorised transport or extending broadband. Government or other public investment may be required to underwrite the costs of extending infrastructure to poor communities. Public investment can be through subsidies, incentives and collaboration with the private sector or by directly investing in additional infrastructure.

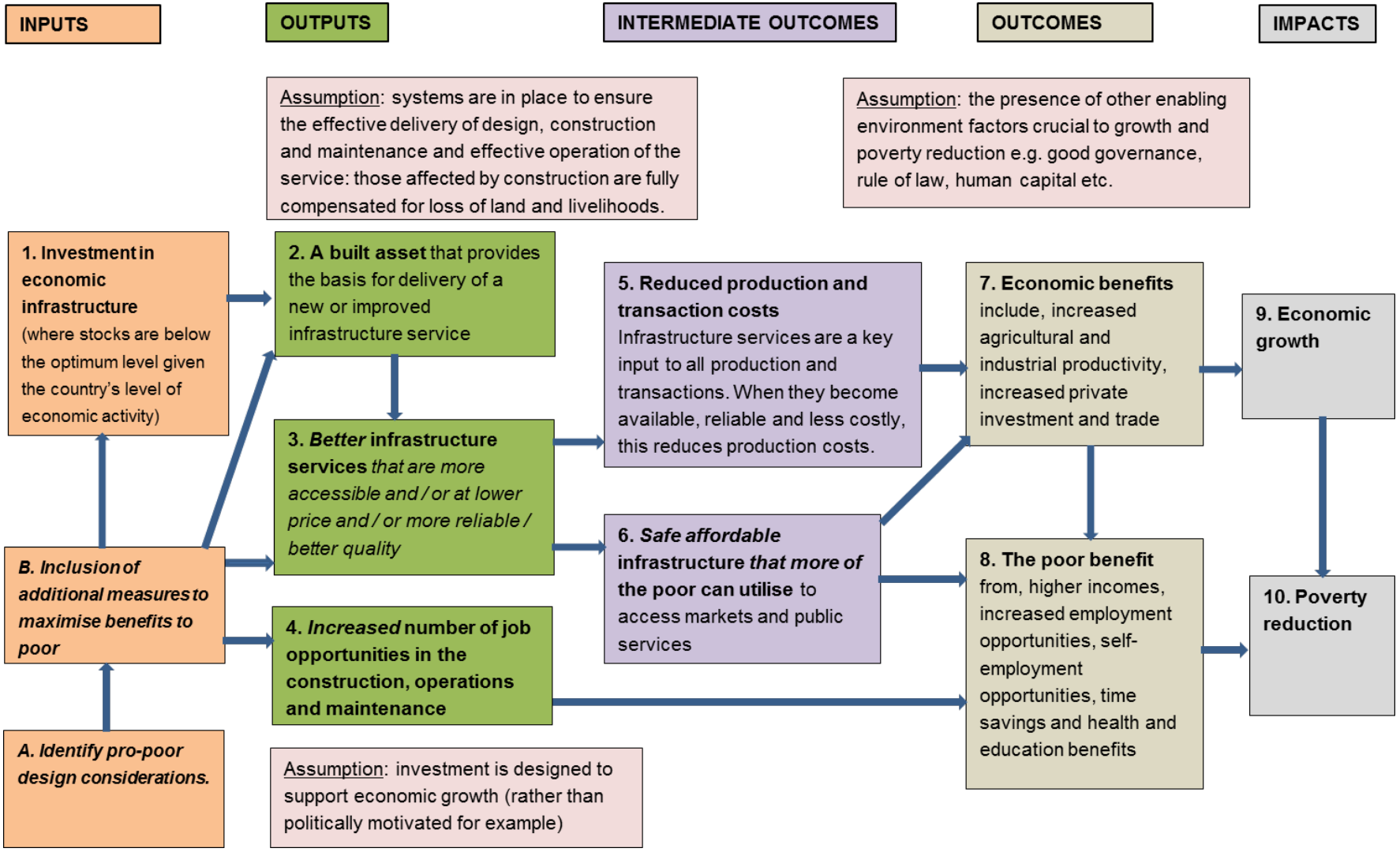
Affordability can be addressed by subsidising the cost of accessing a service, (for example subsidising connections to the electricity grid or setting flat fares for urban transport services). However, the poorest do not always benefit from the subsidy. Thus, it is important to balance the proportion of the poor who will benefit from reduced prices against the economic viability of the scheme. Competition can also play a critical role in reducing the costs of infrastructure services in some sectors, especially in ICT. In the extractives sector, partnerships with the private sector and dedicated corporate responsibility programmes can help increase access and affordability.

Engaging communities either through formal consultations or as key stakeholders in partnership associations, such as water user associations in irrigation and public-private-community partnerships in energy, has proved effective in improving outcomes for the poor. Partnerships have also proved effective in enabling the public and private sectors to work more closely together to benefit the poor. In addition, providing poor communities with information and training can help them improve their livelihoods and make best use of services. Examples include agricultural extension services and engaging local people to maximise the benefits of ICT in their communities. Consumer training and information can improve user productivity in the ICT and energy sectors.

Table 3 shows the additional benefits to the poor from these kinds of additional measures include self-employment opportunities, time savings, improvements in health and education, and the lives of women and children. . We also see that employment and incomes are enhanced with the inclusion of additional measures. In all infrastructure sectors, a local content policy can create additional jobs along construction, operations and maintenance supply chains. Strategic planning in the extractives sector can also deliver jobs and grow enterprises by enabling spatial and sectoral links. .

Based on this evidence, it is essential that additional measures are considered in project designs as it can create significant direct benefits for the poor and provides a greater likelihood of a pro-poor outcome.

Figure 9 Theory of change for investment in economic infrastructure with additional measures[17]



[17] Figure 9 is based on a theory of change developed by Lily Ryan-Collins, Department for International Development.

Bibliography

1. Key evaluations

The bibliography rates sources as 1, 2 or 3. Sources rated '1' are robust analyses most relevant to the current study. Readers may want to prioritise reviewing these sources if they have limited time. Studies rated '2' are also relevant and of generally good quality. Those rated '3' are less relevant, may have unclear methodology or may be more than ten years old, but are included because they address a key dimension not adequately covered by other sources. Note that ratings are not a judgement of academic quality; they indicate the relevance of the source to the current purpose.

Study	Rating	Synopsis and relevance
Energy		
Dinkelman, T. (2011) 'The Effects of Rural Electrification on Employment: New evidence from South Africa', *American Economic Review, 101(7)*, p3078-3108.	1	Using a quasi-experimental approach, the author explores variations in electricity project placement and timing, adjusting for product placement using land gradient. She uses several new data sources and two different identification strategies, an instrumental variables strategy and a fixed effects approach. The paper estimates the impact of electrification on employment growth by analysing South Africa's mass roll-out of electricity to rural households. The author found that within five years treated areas move towards electricity for cooking with a significant increase in female employment. Hours of work increased for both men and women, but female wages fell and male earnings increased. The evidence suggests that household electrification can raise employment by releasing women from tasks in the home (electricity for cooking) and enabling microenterprises. Migration behaviour may also be affected.
Eberhard, A., Foster, V., Briceño-Garmendia, C., Ouedraogo, F., Camos, D. & Shkaratan, M. (2008) *Africa Infrastructure Country Diagnostic. Background Paper 6.* Department for International Development.	2	The study is based on country-specific analyses of national energy needs and trends, policy approaches and developments in private sector participation. The paper includes cross-country comparisons of these trends within the sub-Saharan region. Eberhard et al. provide an overview of the state of the power sector in sub-Saharan Africa. They discuss the effectiveness of power generation and transmission, coordination between state institutions and independent power producers (IPPs) as well as the potential and limits to private and public financing of energy projects. The authors argue that through the provision of mini-grids and alternative energy sources IPPs are able to address local energy needs with more flexibility and provide national grids with reliable power. They call for the use of so-called electrification funds and provide evidence for the benefits of cross-border cooperation on energy generation and transmission. While the authors are optimistic about the role of IPPs in small-scale energy production, they call for investment in large energy infrastructure projects, which are not attractive to private investors, by national governments and international development banks. They also argue for the introduction of

Study	Rating	Synopsis and relevance
		incentives for private investment, such as tax breaks and subsidies.
IEG (2008). *The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits.* Independent Evaluation Group, World Bank, Washington DC.	1	IEG reviewed 120 World Bank-supported projects with rural electrification (RE) activities since 1980. The projects fell into three categories: (i) dedicated RE projects; (ii) energy projects with RE components; and (iii) multi-sector projects with RE. Only 7 percent had an explicit poverty reduction objective although 60 percent had the objective of improving welfare. The study concluded that the largest share of benefits from RE were captured by the non-poor – although the gap closed as coverage expanded – because of access and affordability constraints. Some countries included social variables in their eligibility criteria and in other cases (e.g. Ghana) the Bank acceded to a country's request to ensure geographically equitable coverage. In a few cases, RE funds were used to offset the cost to private companies of extending coverage to less advantaged rural areas (i.e. a subsidy for the provider). The review found that off-grid provision can serve remote communities but is more expensive and does not necessarily reach the poor more effectively. As off-grid services are usually provided through a private business model, social concerns have to be weighed against financial viability. Project design components that would enhance project benefits are summarised as: (i) funding for connections; (ii) consumer education; and (iii) support for productive uses.
Information Communication and Technology (ICT)		
Aker, J., & Mbiti, I. (2010). *Mobile phones and economic development in Africa.* Center for Global Development Working Paper, (211).	2	Aker and Mbiti examine the expansion of mobile telephone coverage and technology in sub-Saharan Africa over the past ten years and evaluate the potential impact on people's lives. They identify and analyse the channels through which mobile phone technology impacts socio-economic development. They find only limited evidence of benefits generated for the poor by increased mobile coverage and access to mobile telephone technology. Areas where mobile coverage is less likely to reach are areas where access to ICT is expected to benefit the poor the most. For example, the authors cite evidence from the fisheries sector in Kerala, India, and the education sector in Nigeria to show that more densely populated and developed areas are more likely to attract ICT. However, it is the rural areas, where population density and income per capita are low, which most benefit from access to information and affordable means of communication.
Cecchini, S. & Scott, C. (2003). 'Can information and communications technology applications contribute to poverty reduction? Lessons from rural India', *Information Technology for Development*, 10(2), p73-84.	3	Cecchini and Scott study the impact of ICT on poverty reduction. Based on field research in India and a theory based on a diffusion mode they explain why a digital divide may exist between rich and poor. They argue that 'low-cost access to information infrastructure is a necessary prerequisite for the successful use of ICT by the poor, but [that] it is not sufficient'. According to their findings, for ICT to benefit the poor, organisations and individuals, which have experience and the right incentive to work with the poor, should not only ensure that ICT is widely available and financially accessible, but also that local ownership is maximised and that the needs of the poor are reflected in the design of ICT projects. The authors outline a number of practical measures, such as using local languages, signs, pictures and intermediaries to increase the awareness and benefits of ICT services. However, the relevance of the paper is limited because it is over 10 years old.

Study	Rating	Synopsis and relevance
IEG (2011). *Capturing Technology for Development: An Evaluation of World Bank Group Activities in Information and Communication Technologies. Evaluation Summary.* Washington DC: Independent Evaluation Group.	1	The IEG's report evaluates the World Bank's contribution to the growth of ICT and its benefits through promoting sector reforms, ICT skills development, and access to information infrastructure and ICT applications. It finds that 'the Bank Group's most notable contributions have been in sector reforms and support to private investments for mobile telephony in difficult environments and in the poorest countries [and that] countries with Bank Group support for policy reform and investments have increased competition and access faster than countries without such support'. The paper also suggests that the most effective way of promoting poor people's access to ICT is through 'general, non-targeted interventions focused on the enabling environment and direct support to private investments' and that public-private partnerships and ICT skills development are some of the potentially more successful targeted approaches.
Irrigation		
IEG (2008) *Impact Evaluation of India's Second and Third Andhra Pradesh Irrigation Projects: A case of poverty reduction with low economic returns.* Washington DC: Independent Evaluation Group, World Bank.	1	This impact evaluation used a quasi-experimental design based on existing and new survey data to evaluate one of the World Bank's last 'old generation' projects, in which the Bank directly supported the creation of a new irrigation scheme. The results confirm a substantial impact on reducing poverty. Investments in irrigation increased yields and cropping intensity as well as reducing inter-year fluctuations in income. But the expected diversification into higher value crops did not occur. The poverty rate fell by a quarter in the first year and to a greater extent in the long run as vulnerability to rainfall shocks (which undermine the asset base) lessened. While larger land owners benefitted most in absolute terms, the greatest growth in income accrued further down the income scale, mainly because of growth in wage employment. The poorest gained the least but still enjoyed income growth of about 20 percent. However, the ex post rate of return (ERR) was only 2 percent, due to cost overruns, construction delays and discrepancies between expectations and realised income gains. Also, the evaluation indicated that benefits would only be sustained if the facility is maintained. The projects were at the forefront of participatory irrigation management (PIM). Water user associations (WUAs) were expected to take responsibility for operations and maintenance. But WUAs lacked the technical capacity to solve the problems of water allocation and were unable to provide sufficient funds for maintenance. WUAs did not facilitate greater participation by the poor and disadvantaged groups: the poorest were excluded because they are mostly landless and because higher castes dominate the leadership. The authors concluded that WUAs are not a panacea – there is a continuing role for governments in facilitating both technical aspects and equitable water distribution. Pricing also needs addressing as current policy encourages water wastage. The direct income benefits to farmers from irrigation mean there is potential to fully recover the recurrent costs of

Study	Rating	Synopsis and relevance
		services. Current water charges are only a tiny fraction of the net increment in income that irrigation makes possible. Increasing water charges is necessary for sustainability of the system.
Sawada, Y., M. Shoji, M., Sugawara, S. & Shinkai, N. (2010) *The role of Infrastructure in Mitigating Poverty Dynamics : A case study of an irrigation project in Sri Lanka*, *Working Paper No. 4.* JICA Research Institute.	1	This study evaluates the role of irrigation in reducing chronic and transient poverty by regulating water availability across seasons. The study used a stratified random sample to identify households in irrigated and non-irrigated areas. Household-level monthly panel data collected over two years showed that per capita income increased on average by 7.8 percent, food consumption expenditure by 12.2 percent and non-food consumption expenditure by 37.6 percent, suggesting that irrigation reduces chronic poverty by enhancing income. The probability of binding credit constraints also reduced by 5.6 percent during the dry season, which suggests that irrigation enhances access to credit, which in turn contributes to a further reduction in transient poverty.
Duflo, E. & Pande, R. (2005) *'Dams', National Bureau of Economic Research, Working Paper 11711.* Also in *Quarterly Journal of Economics, 122(2),* p 601-646.	1	This evaluation of dams constructed in India for irrigation (not for hydroelectric power or flood control) focuses on the distribution effects. The authors identified winners and losers from dam construction. Winners live downstream of the dam (in the command area) and the losers in the vicinity and upstream of the dam (the catchment area). The evaluation found that agricultural production increases and poverty declines in the districts located downstream, but vulnerability to rainfall shocks and poverty increase in the catchment area. In principle, the aggregate gains could be used to compensate those who lose land or livelihood. This did not happen because the displaced population lacked political power and organisational abilities. The authors conclude that the evidence suggests that constructing large dams in India is a marginally cost-effective investment (authors' calculations suggest a barely positive net present value of 1%), and that the strikingly unequal sharing of costs and benefits has, in aggregate, increased poverty.
Transport		
Hansen, S. (2010) *ADB's Contribution to Inclusive Growth in Transport and Energy Projects, Asian Development Bank Sustainable Development Working Paper Series* Manila: Asian Development Bank.	2	This paper evaluates the potential contribution of transport and energy projects funded by the Asian Development Bank (ADB) to inclusive growth. The authors developed a methodology to measure and quantify inclusive growth, and applied it to 18 ADB transport and energy projects completed between 2000 and 2010. The paper also provides useful insights into the measures that could enhance inclusive growth. The evaluation was, however, based on projected rather than actual outcomes of a number of ongoing projects. ADB identifies five broad categories of impact that contribute to inclusive growth: • The impact of the project on growth and employment among the very poor (<USD1.25 per day) and the moderately poor (<USD2 per day) as well as excluded groups; • The impact on asset distribution; • The impact on human capability – non-income dimensions of development (health, education etc.); • The impact on social protection and risk mitigation; and • The impact on sustainability and governance of the project, such as structural changes to

Study	Rating	Synopsis and relevance
		reduce inequalities. The authors developed indicators for each category, weighted for each infrastructure subsector according to relevance, and compiled the scores (up to 100) on each project. For the purpose of this Topic Guide we examined the outcomes of transport sector projects in sections 3.2.1 to 3.2.3. The paper demonstrates very clearly the diversity of infrastructure projects and the wide variations in their contributions to inclusive growth and poverty reduction.
Pendakur, V.S. (2005) *Non-Motorized Transport in African Cities, Lessons from Experience in Kenya and Tanzania. Sub-Saharan Africa Transport Policy Program (SSATP) Working Paper No. 80*. Washington DC: World Bank.	1	This evaluation reviews the long-term outcomes from a programme of non-motorised transport (NMT) infrastructure and services in Kenya (Nairobi and Eldoret) and Tanzania (Temeke, ward of Dar es Salaam and Morogoro) in the late 1990s. Pilot projects introduced non-motorised infrastructure, such as cycle ways, footbridges and footpaths, and road traffic safety measures and minibus stops. The aim was to include NMT components into existing urban transport programmes but this met with some resistance from donors and consultants. Despite this, the report provides very useful evidence of the potential of incorporating NMT into broader urban transport programmes. The report: (a) documents the background to urban mobility in sub-Sahara Africa; (b) describes the NMT pilot projects and the results of post-project monitoring; (c) documents the various assessments of the programme; and (d) draws 'lessons from experience' for formulating and implementing future NMT programmes in sub-Sahara Africa. The outcomes of the programme are described in Case Study 6.
World Bank, (2012) *Implementation and Completion and Results Report for the Lima Transport Project*, Washington DC: World Bank.	2	This is a very interesting evaluation of an urban transport project in Lima, Peru, where a number of measures looked to benefit the poor in addition to improving economic productivity. The main objective of the project was to establish an efficient, reliable, cleaner and safer mass rapid transit system. The specific objectives were to: (i) implement a new mass rapid transit system on the basis of a public-private partnership (PPP) with a concession bus corridor/feeder routes operations and fare collection system; (ii) improve access in low-income areas by facilitating the use of low-cost transport alternatives, such as bicycles and walking; (iii) strengthen local institutional capacity to regulate and manage the metropolitan transport system on a sustainable basis; and (iv) reduce the negative environmental impact of motorised transport in Lima. The evaluation provides useful outcome-based targets to benefit the poor and useful lessons as to why some of the low-cost transport alternatives were not as successful as anticipated (Section 3.2.3 and Case Study 5).
Infrastructure Associate with the Extractives Sector		
Council for Scientific and. Industrial Research (CSIR) and CI (2004) *Maputo Development Corridor: Evaluation of First Phase.*	3	This study, conducted to inform decision makers, examined the progress of the Maputo Development Corridor (MDC) and the interventions needed to remove barriers to progress. The study included a spatial and impact analysis. Changes in a number of indicators (macro-economic, socio-economic and environmental) in the MDC area (generally 1996-2002 depending on the indicator) were analysed to determine whether positive changes were more pronounced in areas close to the corridor than in areas further away from the corridor. The analysis of impacts was

Study	Rating	Synopsis and relevance
		supplemented by comparing actual performance with projections made by Capricorn in 1995. In general, the analysis revealed a stronger correlation between positive changes in the values of selected indicators during the analysis period and proximity to the corridor in the case of macro-economic impacts than in the case of socio-economic impacts. Note also that causality and the link between infrastructure and development could not be statistically proven.

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