Background Paper: Contribution of Infrastructure to Growth and Poverty Reduction in East Asia and the Pacific

Prepared by Stephen Jones

October 2004
This paper was commissioned for the ADB-JBIC-World Bank East Asia Pacific Infrastructure Flagship Study. The views expressed are those of the author only.
Table of Contents

List of Tables ................................................................................................................. iii
List of Figures ................................................................................................................ iv
Acknowledgements and Disclaimer ........................................................................... v
Executive Summary ...................................................................................................... vi
1. Introduction ............................................................................................................. 11
2. Conceptual Framework ............................................................................................ 12
   A. Introduction ........................................................................................................... 12
   B. Defining Infrastructure ........................................................................................ 13
   C. Infrastructure and Market Failure .................................................................... 14
   C. Poverty and Infrastructure ............................................................................... 18
   D. Direct and Indirect Impacts of Infrastructure ............................................... 20
   E. Accountability and Political Factors ................................................................... 24
3. Poverty and Infrastructure in East Asia and the Pacific - Overview ......................... 27
   A. Features of Poverty in the Region ..................................................................... 27
   B. Infrastructure Provision and Access ................................................................. 32
4. Evidence on Infrastructure-Poverty Linkages .......................................................... 41
   A. Modelling Infrastructure Impact on Growth and Poverty .............................. 41
   B. Impact Studies .................................................................................................... 45
   C. Studies of the Impact of the Policy and Institutional Framework ................... 48
5. Policy Implications ................................................................................................... 56

Bibliography/List of References ..................................................................................... 59

List of Tables

Table 1: Infrastructure and Service Provision – Main Sectors 16
Table 2: Market Failures Associated with Infrastructure Services 17
Table 3: Potential Positive Impacts of Infrastructure Services on the Poor 23
Table 4: Poverty Incidence – International $1/Day Definition 27
Table 5: Performance Against Selected MDGs, 2001 28
Table 6: Indicators of Transport Infrastructure Provision 33
Table 7: Electricity Consumption, Losses and Electrification Rates 34
Table 8: Expansion of Telephone Access (per thousand people) 1990-2002 35
Table 9: Access to Improved Water Sources, 1990 and 2000 37
Table 10: Access to Improved Sanitation, 1990 and 2000 38
Table 11: China – Regional Differences in Rural Infrastructure 39
Table 12: Poverty Impact of Alternative Forms of Rural Public Investment in China 44
Table 13: Governance Indicators – 2002 and change from 1996 54

List of Figures

Figure 1: Summary of Conceptual Framework 22
Figure 2: Accountability Mechanisms in Infrastructure Services 25
Acknowledgements and Disclaimer

This study was commissioned and funded by the Asian Development Bank, however the conclusions and views expressed are the consultant’s alone.

Thanks are due to Tini Chatterjee who provided research assistance and David Stafford of OPM for important suggestions.

The study has benefited from a wide range of perspectives and suggestions arising from the Study Workshop in Bali in June 2004, and in particular comments from Mark Baird, Jonathan Walters and Rita Nangia (who commissioned and managed the study) as well as from comments on an earlier draft.

Particular thanks are also due to the following ADB staff who were interviewed in Manila: Stephen Curry, Tyrell Duncan, David Edwards, Peter Fedon, Patrick Giraud, Edward Haugh, Hemalmala Hettige, Eunkyung Kwon, Marcelo Minc, Nigel Rayner, Anil Terway, Xianbin Yao, and Xiaoyun Ye.
Executive Summary

The objective of this paper is to present a synthesis of the links between infrastructure development and growth, service delivery and poverty reduction in the East Asia and Pacific region. The findings of this background paper are intended to set the policy objectives of the wider study in terms of infrastructure provision and financing and to inform the treatment of other key themes in the study. The paper seeks to develop a framework that will broaden and deepen the debate about pro-poor policies and infrastructure development.

The framework starts from the definition of infrastructure as a particular form of capital good characterised by a high intensity in the use of the capital good in producing the related services, and being generally lumpy rather than incremental (implying first that there are difficulty in matching supply to fluctuations in demand and second that lag times in construction can be long), long-lasting and space specific. As a result, a high proportion of the costs of the capital are sunk costs, with important implications for potential market performance.

In relation to potential or actual market failures associated with infrastructure investment, all of the sectors exhibit important spatial monopoly features and involve investments that are difficult to reverse or liquidate and are long-lasting (so that sunk costs are a high proportion of the total cost of the infrastructure). As a result, they are subject to both a potential need to regulate investment decisions and to moral hazard (and hence political risks for the investor) related to the incentives for manipulation of the regulatory environment to the short-term benefit of consumers once an investment has been made, or indeed the nationalisation of infrastructure investments. There also tend to be significant economies of scale associated with these types of investment (measured in terms of cost per unit of service capacity). The services provided using infrastructure are typified by important externalities. They are not generally public goods, though the scope for using price mechanisms to exclude users is limited in many cases by what is regarded as politically acceptable.

The impact on the poor of improved infrastructure services may be defined as direct or indirect, according to whether it derives from the use of the services (participation in the market) by poor people themselves, or by others (such as potential investors whose activities may create jobs). The indirect impacts of improved infrastructure service provision on the poor are mediated through other markets.

Of central importance to determining the impact of infrastructure investment and service provision on the poor is the extent to which the interests and voices of the poor are able to exert influence over decision-making at each stage from the planning of investments through construction to maintenance and regulation, and at each level of decision-making from the international to the local. Understanding the political economy of decision-making processes and the role and influence of different stakeholders within these processes is a necessary part of an analysis of infrastructure-poverty linkages. The paper outlines the accountability framework used in the 2004 World Development Report as providing a useful framework for examining the extent to which decision-making is likely to be influenced by the requirements of the poor.

Despite the diversity of countries within the region, clear common patterns emerge in relation to the nature of the poverty problem and underlying trends in East Asia and the Pacific:

- There has been substantial progress in poverty reduction, though this has slowed as a result of (a) in some countries, depressed economic performance following the 1997-8 crisis and
Contribution of Infrastructure to Growth and Poverty Reduction

(b) in countries where growth has been maintained, a move towards less pro-poor patterns of growth, in particular a less favourable environment for agriculture than in earlier years.

- Poverty is overwhelmingly located in rural areas, and is associated with dependence on agriculture, low educational attainment, and location in economically lagging regions (often highland, inland or outlying islands), which frequently have disproportionate numbers of people from ethnic minorities.

- There is substantial year to year movement of households around the poverty line, so it is typically the case that a far larger number of households fall intermittently below the poverty line than are permanently below it.¹

- Urban poverty is however becoming more significant and is increasing its share of total poverty (and apparently increasing in absolute numbers in some cases). Urban poverty is associated with unemployment and concentrated on recent migrants from rural areas.

- There is a high degree of correlation between income/consumption poverty and other aspects of poverty and deprivation including health status, access to education, and access to infrastructure.

- Significant proportions of the population in several countries are located just above the poverty line and are therefore highly vulnerable to adverse shocks, in a context where safety net arrangements are extremely weak.

- Legacies of conflict and insecurity have a particularly adverse impact on poverty.

The overall picture for infrastructure access for the region may be summarised as follows:

- There is a high degree of variation in infrastructure access both between countries and within countries. Within countries, rural areas substantially lag urban in all dimensions of infrastructure access.

- Several countries (notably China and Vietnam) have achieved rapid expansion in infrastructure access across most or all dimensions and are closing the gap on the South East Asian countries where rates of progress (outside the telecommunications sector) have been relatively modest.

- While the data is difficult to interpret and cross-sectoral comparisons are problematic, progress in road access and quality appears to be slower than in other sectors. Improvements in water and sanitation also appear to be relatively slow.

- Cambodia and Lao PDR appear to be making significant progress but from a much lower base.

- Some other countries (Myanmar, PNG, some of the Pacific Island states) are stagnant or making much less progress in terms of infrastructure indicators.

¹ For example, Spencer (2004) quotes a panel data study of Sichuan which found over a five year period that 30% of households fell below the poverty line in at least one year, while only 2.4% were below the poverty line in all five years, and the average number below the poverty line was 11-14%.
New investment and technological advances (facilitated by regulatory reforms) have led to a revolution in access to telephone communications, which are now penetrating into rural areas as costs fall. However nothing like the rate of technological change that has made this possible is in prospect for the other infrastructure sectors.

Three main types of study of the impact of infrastructure on poverty can be distinguished:

- Studies that measure the relationship between infrastructure variables and growth or poverty indicators using estimates of production functions at the national or sub-national level.
- Impact studies that focus on particular investments using a wider variety of quantitative and qualitative analysis methods.
- Studies that focus not on investment impacts but on the way in which institutional and policy factors have affected the provision of infrastructure and the access that the poor have to it.

Robust findings that emerge from this literature include the following:

- Strong international evidence that infrastructure investment is central both for growth and for reducing inequality and making growth patterns more pro-poor.
- Additional growth and poverty reduction benefits from particular sectoral investments, notably in water and sanitation and roads.
- Evidence of generally high economic returns to infrastructure investment, and within the region high economic and poverty reduction impact from rural roads investment, particularly when complemented by other forms of public expenditure, notably education.
- Limited progress to date in the region in implementing key institutional and policy reforms for infrastructure, and some evidence of a decline in governance indicators that are plausibly related to the ability to attract private infrastructure investment and manage effective public infrastructure investment.

The key conclusions of this review are:

- Achieving rapid economic growth requires investment in infrastructure, and higher levels of infrastructure investment (especially where these focus on broadening access to opportunities and integrating remote areas with national and international markets) are also likely to be associated with a relatively more pro-poor pattern of growth – a well-tailored infrastructure investment strategy may be able both to achieve growth and to at least temper the trend towards increasing inequality.
- While some countries in the region are succeeding in sustaining exceptionally high levels of public investment and also attracting increasing private investment in infrastructure, in others fiscal stress and a lack of confidence from potential private investors means that the gap between infrastructure needs for growth and poverty reduction and current investment levels is very high.
- Poverty within the region remains overwhelmingly rural and concentrated in areas that are poorly connected to national centres of growth and to export markets. Infrastructure
Contribution of Infrastructure to Growth and Poverty Reduction

investment is of central (though not sole) importance for achieving this. The impact on employment opportunities for the poor will be decisive in determining overall poverty impact.

- At the same time, rapid urbanisation is continuing and this is putting additional strain on urban infrastructure, as well as leading to dense settlement in peri-urban areas that are often very poorly equipped in terms of infrastructure. The rapid pace of urbanisation, and the fact that infrastructure provision in both rural and urban areas is likely to impact on this rate, means that national infrastructure strategies have to address both rural and urban infrastructure provision and the interaction between the two.

- There are strong a priori reasons and empirical evidence to suggest that across much of the region rural roads and improved water and sanitation services are the forms of infrastructure investment that will have the greatest positive direct impact on the poor. These are sectors where performance appears to have lagged other more dynamic sectors, and where cost recovery and attracting private investment have proved particularly problematic, although there are positive examples.

- There has to date been relatively limited progress within the region in effective policy and institutional reform in the sectors where infrastructure is important, particularly outside the telecommunications sector where the rapid pace of technological change has driven reform.

- Pricing policies for infrastructure services often involve subsidies but these appear to be poorly targeted on the poor particularly to the extent that the size of subsidy received is generally proportional to the use of the service, rather than being focused on widening access to those who are currently not served.

- The extent to which the interests or voices of the poor are reflected in decision-making about infrastructure (whether at national or local level) is important for determining impact. Community participation plays an important role in ensuring effective and sustainable provision of infrastructure services at the local level, but reaching the poor still poses major challenges.

The key elements of a pro-poor infrastructure strategy are identified as:

- Improved growth (as well as more pro-poor patterns of growth) requires higher levels of infrastructure investment in most countries in the region. In a few, notably China, the problem is one of managing the risk of overheating and overinvestment, while also seeking to raise the quality of investment and direct it towards priorities for poverty reduction. While there are substantial opportunities for increasing private investment, public investment in aggregate is likely to be a complement to this rather than a substitute for it.

- The prospects for both effective public investment and for attracting private investment depend on improving key aspects of governance and the policy environment, as well as creating fiscal space for investment-oriented public expenditure.

- A planning perspective is required that is explicitly cross-sectoral and informed by an analysis of the nature of poverty at national and sub-national level and an understanding of the ways (both direct and indirect) in which infrastructure investment and service provision is likely to impact on the poor, including through its impact on the rural-urban migration dynamic. The strategy needs to consider the operation of markets for infrastructure services as well as the investments themselves.
• Such a strategy is likely to lead to infrastructure investment needs to be placed at the heart of public expenditure priorities as expressed in poverty reduction strategies. In general, investment (in maintenance as well as new capital) in rural roads, water and sanitation and in transport and communications infrastructure will be central for a strategy for improving the integration of lagging areas into the national and international economy.

• Achieving effective participation in decision-making by, and improved targeting on, the poor is central to a pro-poor infrastructure strategy.
Contribution of Infrastructure to Growth and Poverty Reduction

1. Introduction

This background paper was commissioned by the Asian Development Bank as a contribution to the ABD-JBIC-World Bank Flagship Study “Infrastructure in East Asia: the Way Forward.” The context of the Study is a sharp fall in investment in infrastructure projects in the region with private participation, following the financial crisis of 1997, from a peak of US$ 41 billion in 1997 to less than half this in subsequent years, as well as low levels of official lending for infrastructure in relation to apparent need.

The objective of the paper is to present a synthesis of the links between infrastructure development and growth, service delivery and poverty reduction in the region. The findings of this background paper are intended to set the policy objectives of the wider study in terms of infrastructure provision and financing and to inform the treatment of other key themes in the study.

Part of the purpose of this paper is to develop a framework that will broaden and deepen the debate about pro-poor policies and infrastructure development, by focusing on the policies, future planning and monitoring aspects. The paper seeks to analyze the role of the policy and institutional contexts and local factors (including political conditions) in determining the extent to which infrastructure helps the poor, and so to identify the types of infrastructure policies that are most likely to have a positive impact on the poor, either directly in terms of access to improved services, or indirectly, for example, through economic growth and the creation of employment opportunities.

The paper is based on a literature review and interviews with ADB staff during a visit to Manila in May 2004. Preliminary findings were presented at the workshop held in Bali in June 2004 and the paper is informed both by comments from participants at the workshop and other members of the Flagship Study team, and by other papers presented at the workshop which gave a valuable perspective on the current state of policy debate and knowledge within the region.

This paper is structured as follows. Section 2 presents a Conceptual Framework for the paper which begins from a definition of the economic characteristics of infrastructure, distinguishes between issues related to infrastructure investment and the provision of infrastructure services, and examines the range of direct and indirect channels by which infrastructure can impact on the poor, distinguishing also between different definitions of poverty. Section 3 provides an overview of information on the characteristics and comparative levels of poverty, and of infrastructure provision and access, within the region, with a view to identifying salient features of relevance for understanding policy priorities in relation to poverty reduction. Section 4 reviews the evidence on infrastructure-poverty linkages, distinguishing between three main types of evidence – econometric studies relating poverty to infrastructure variables, impact studies that assess the results of particular investments, and studies focused on the effects of policy change. Section 5 reviews the main infrastructure policy issues in the region in relation to the likely impact of alternative policy choices on poverty, and the infrastructure priorities for poverty reduction. Section 6 outlines the possible policy implications of the study.
2. Conceptual Framework

A. Introduction

There is a large literature that discusses the impact of economic infrastructure of various kinds on both economic growth and on poverty reduction. Several points can be made about this literature, which is reviewed in detail in section 4:

- Empirical work is of three main types:
  1. First, studies based on the estimation of production functions that relate data on infrastructure investment of different types (measured in value or quantity terms) to variables related to economic growth or different measures of poverty. These studies can provide quantitative estimates of parameters of policy importance, but interpretation of their results involve problems relating to econometric methodology and data;
  2. Second, case studies of the impact of particular investments. These have a much richer description of the mechanisms by which investments affect the poor but are limited in the breadth of the conclusions that can be drawn from them.
  3. Third, studies of the impact of particular policy and institutional reforms, which typically also use a case study approach.

- Typically in this literature the term “infrastructure” is not defined in economic terms (instead the focus is on particular sectoral investments or expenditure), and there is a tendency in the macro studies to focus on infrastructure investment rather than the supply of infrastructure services, or the way in which the investment is managed or used. The analytical frameworks used tend to be partial, in that they focus on the linkages between particular selected variables, rather than attempting to present a comprehensive overview of the channels of influence.

- As a result of differences in approach, focus and methodology, the overall implications of this literature can be difficult to interpret. It is not surprising that general quantitative conclusions about impact are difficult to draw, since there is no a priori reason to expect that impacts will be similar in different contexts. However, a more systematic and comprehensive approach should make it easier to understand the way in which a particular context is likely to influence impact, and the relative importance of different channels in different circumstances.

The framework presented here seeks to provide a way of understanding and integrating insights from the different strands of this literature, while also providing an approach that is sufficiently general to encompass a range of definitions of poverty. It therefore has the following characteristics:

- It seeks to provide a comprehensive approach to understanding, in general terms, the possible channels of impact of an infrastructure investment on the poor.
- Its starting point is a definition of infrastructure that focuses on its economic characteristics as a particular type of capital good, rather than a collection of investments defined by their sectoral scope.
• The framework emphasises the economic characteristics of the services that are derived from infrastructure investments, and focuses on the performance of the market for these services and the terms of access to these markets that the poor face.

• It allows consideration of alternative definitions of poverty.

• It distinguishes but relates direct impact on the poor as users of infrastructure services from indirect impacts through complementary investments and public finances.

The starting point for the framework is therefore the definition of infrastructure.

B. Defining Infrastructure

The key characteristics of economic infrastructure can be defined as follows (following and developing Prud’homme, 2004). Infrastructure is:

• A capital good, which therefore produces a service in combination with other inputs (implying that it is ultimately how the market for this service works that affects users, not provision of the infrastructure alone). The services provided are relatively intensive in this form of capital and tend to exhibit important economies of scale.

• Generally lumpy rather than incremental (which implies first that there are difficulty in matching supply to fluctuations in demand and second that lag times in construction can be long). For example, the building of a bridge or section of rail track produces no services until the investment has been completed.

• Long-lasting (with implications for financing and maintenance).

• Space-specific in the location of services provided (so that siting decisions are of critical importance given the non-reversibility and lumpiness of investment) and use-specific in that it cannot be switched to an alternative function – as a result a high proportion of the costs involved in infrastructure are sunk costs.

• A source of services provided both for final consumption by households and for enterprises, as an input into productive processes.

This definition has a number of implications for what should be regarded as infrastructure within the context of this Conceptual Framework, with the proportion of sunk costs in total costs of service provision being in principle a useful marker of the infrastructure content of a service. For example, many forms of electricity generation do not require infrastructure in this sense, while electricity transmission and distribution always do. Much irrigation investment (e.g. canals) does however share the characteristics of this definition. Technological changes will also affect the need for infrastructure as opposed to other forms of capital in providing services. For example the development of mobile telephony has significantly reduced (though far from eliminated\(^2\)) the infrastructure component in telephone service provision. Buildings share most of the characteristics of infrastructure but (a) can generally be added to in an incremental fashion, (b) are...

\(^2\) For example Ure (2004) provides data for the Philippines for 2002 indicating that sunk costs comprise 79% of total cost for a fixed network operator and 61% for a mobile provider.
relatively easy to switch between functions, and (c) their cost is generally a relatively small proportion of the total costs of the services provided from them. While education and health service provision has an infrastructure component (schools, hospitals) this is of less fundamental importance to policy in these sectors than in others where infrastructure is a much higher proportion of total costs.

The main infrastructure sectors are therefore treated as including the following: electric power, piped gas, roads, railways, urban mass transit, ports, airports and information and communications technology.

C. Infrastructure and Market Failure

These characteristics suggest a number of ways in which the market for the capital goods that comprise economic infrastructure is likely to be prone to market failure. For instance, the long-term nature of infrastructure investments and their irreversibility (a factory containing machine tools can be relocated or closed when the machine tools become obsolete, a railway or water supply system cannot be) makes them particularly subject to political, as well as demand, risk—which is likely to be increased by the political and social sensitivity of many of the services provided. Irreversible investments, once made, may be subject to predatory interference either to meet social pressures to keep the price of basic services low, or as a focus of rent-seeking.

The markets for the services provided using the infrastructure are also likely to be subject to market failure, though the extent to which this in fact occurs and the nature of these market failures differs markedly between services. The space-specific nature of infrastructure means that there is a strong likelihood that it will involve a locational or “natural” monopoly (to the extent that the owner of the infrastructure is also the supplier of the service), since it will not be viable to make competing infrastructure investments at the same location, while a high proportion of sunk costs in total costs means that markets for the services will not be contestable and hence an incumbent provider will enjoy substantial market power. While the provision of a network tends to be naturally monopolistic, provided access to the network can be guaranteed through appropriate regulation,

3 In tropical and subtropical countries the economic viability of distribution for gas is undermined because of the absence of demand for space heating from commercial and residential customers. In addition, the costs of connection, metering, and the difficulties of revenue collection militate against supplying the poorer sections of the community. Consequently, widespread use of gas by residential consumers is not common in developing countries except in some urban areas.

4 Ports in general offer a wide range of services which can be divided up into: Marine services: access and protection, pilotage, towage, vessel traffic management, fire protection, chandlering; terminal services: vessel tie-up services, handling of all sorts of cargo (containers, dry, liquid, general etc), cargo storage, bagging & packaging, container stripping and stuffing; Repair services: dredging and maintenance of channels & basins, dry docks, lift equipment and container repairs; Estate management services; Information management services. Some of the infrastructure required to provide these services would continue to be termed “infrastructure” according to the definition used here, but much of it would not (mainly because equipment etc is movable). There is a wide variety of potential roles that the private sector can play in these services, and all except a few (eg vessel traffic management) could in principle be fully privatised.

5 The main “infrastructure” in the ICT sector is the fixed line telecommunications network, while rapid technical change has affected other elements such as mobile networks, cable, satellite networks, optical fibre rings, broadband networks. The services provided by ICT are even more difficult to define because ICT is a tool for numerous – and rapidly growing numbers of – applications. On top of this the technology is very dynamic and changing.

Oxford Policy Management, October 2004

14
the provision of services using the network are generally technically capable of being provided by a number of competitors. It is important to distinguish between competition within markets (between alternative incumbent service providers) and competition for markets (in the form of competitive bidding for franchises). While the former may not be feasible in markets for infrastructure services that enjoy substantial returns to scale, the latter may be provided that a sufficiently robust regulatory and contract management system can be established.

Typically, there are also technologies for supplying competing alternative services that are not reliant on infrastructure in the same way so that some form of competitive pressure will exist. For example, Foster and Tré (2003) note that approaches to the analysis of energy and poverty have been based on a model of ascent up an energy ladder as incomes increase, from traditional biomass fuels (wood, charcoal), through modern commercial fuels that are not infrastructure-dependent (kerosene, LPG, batteries), to the use of mains electricity and piped gas which are network industries with substantial infrastructure requirements. The empirical literature however shows that the situation is more complicated in that households at any one time typically use fuels from at least two steps of the ladder.

The pervasive nature of market failure associated with infrastructure investment and service provision implies a significant and necessary public role in both the supply of infrastructure, and in the regulation of markets for services provided, though this does not imply that the state must be directly responsible for providing either the infrastructure investments or the services. Typically, there are a wide range of mechanisms by which private financing or management may be encouraged. Fundamental to the viability of these options is the process by which private investors can recover the cost of their investments, and the way in which protection from non-market risks can be provided. The cost recovery mechanism will have an important impact in determining the distribution of benefits from the investment as well its viability. Infrastructure as defined here plays a critical role in economic growth, through creating conditions that either lower the cost of goods and services used by other producers or increasing the potential size of markets that they can reach.

It is the operation of the market for the services provided using infrastructure that is the main interface between infrastructure investment decisions and the impact on users, including the poor. However, infrastructure investment decisions will also directly affect the poor, through for instance the displacement of communities to make way for the investment, and through the creation of employment opportunities directly linked to the construction of the investment, especially where this is relatively labour intensive.

Table 1 summarises the main forms of economic infrastructure and the services associated these forms of investment. In relation to potential or actual market failures associated with infrastructure investment, all of the sectors exhibit important spatial monopoly features and involve investments that are difficult to reverse or liquidate and are long-lasting (so that sunk costs are a high proportion of the total cost of the infrastructure). As a result, they are subject to both a potential need to regulate investment decisions and to moral hazard (and hence political risks for the investor) related to the incentives for manipulation of the regulatory environment to the short-term benefit of consumers once an investment has been made, or indeed the nationalisation of infrastructure investments. There also tend to be significant economies of scale associated with these types of investment (measured in terms of cost per unit of service capacity).
Table 1: Infrastructure and Service Provision – Main Sectors

<table>
<thead>
<tr>
<th>Sector</th>
<th>Infrastructure</th>
<th>Services provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Electric) Power</td>
<td>Transmission and distribution, and some generation</td>
<td>Electricity supplies</td>
</tr>
<tr>
<td>Piped gas</td>
<td>Transmission and distribution (plus exploration &amp; production, LNG, and export pipelines)</td>
<td>Gas supplies</td>
</tr>
<tr>
<td>Roads</td>
<td>Roads and bridges</td>
<td>Passenger and freight transport services by road</td>
</tr>
<tr>
<td>Railways</td>
<td>Rail network</td>
<td>Passenger and freight rail transport services</td>
</tr>
<tr>
<td>Urban Mass Transit (UMT)</td>
<td>Metros/light railways</td>
<td>Public passenger transport in urban areas</td>
</tr>
<tr>
<td>Ports</td>
<td>Berths and major harbour developments</td>
<td>Port services for shipping</td>
</tr>
<tr>
<td>Airports</td>
<td>Airport site and runways</td>
<td>Passenger and freight air services</td>
</tr>
<tr>
<td>Information and Communications Technology (ICT)</td>
<td>Cable and telecommunications networks (plus some parts of the mobile network)</td>
<td>Telephone and other ICT services (difficult to define because of the wide range of applications)</td>
</tr>
<tr>
<td>Water</td>
<td>Dams/reservoirs, major treatment works, transmission and distribution</td>
<td>Water supplies</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Sewerage systems and major treatment/disposal works</td>
<td>Waste water and solid disposal</td>
</tr>
</tbody>
</table>

Table 2 summarises the market failures associated with the supply of particular infrastructure services. A key feature is that there are likely to be positive economic externalities (that is, benefits that cannot be fully appropriated by the supplier of the infrastructure service) associated

---

The table heavily simplifies the issues since typically the potential market failures differ at different levels in the production and supply process. For example, in relation to electric power, the degree of market failure depends on the extent to which the sector has been unbundled and competition introduced where technically feasible. Broadly the structure of the whole sector can vary from a single public body with a monopoly of electricity supply to an unbundled industry comprising (eg UK): Competitive generation; A competitive wholesale market; Transmission – which is a locational monopoly; Distribution (the lines) – which is a locational monopoly; A competitive supply market (to end-users). The sources of market failure are: locational monopoly in the lines business, and sometimes substantial monopoly power in other areas, and externalities associated with many forms of generation (eg air pollution for fossil fuels, resettlement issues for hydro)
with the provision of the all of the services. This will be in the form of reductions in the costs facing producers of other goods and services that are not directly users of the infrastructure service. There are also potentially significant negative environmental externalities associated with the provision of electricity and gas (carbon dioxide emissions) though these may be offset if a comparison is made with other forms of energy supply (such as the use of wood or coal directly for cooking and heat which produces more air pollution). Transport services are also generally associated with negative environmental impacts but the greater use of railways and urban mass transport systems may have a positive environmental impact if this displaces other more environmentally damaging forms of transport. Information and communications technology services do not generally have a strong direct environmental impact. The environmental impact of improved water supply services will depend on the extent to which, for example, over extraction affects the level of the water table or depletion of reserves. Improved sanitation services will generally have a positive environmental impact.

Table 2: Market Failures Associated with Infrastructure Services

<table>
<thead>
<tr>
<th>Sector</th>
<th>Externalities</th>
<th>Non-Rival</th>
<th>Non-Excludable</th>
<th>Information Asymmetries</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Electric) Power</td>
<td>+ (-)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piped gas</td>
<td>+ (-)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roads</td>
<td>+ -</td>
<td>x</td>
<td></td>
<td>?</td>
</tr>
<tr>
<td>Railways</td>
<td>+ +</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UMT</td>
<td>+ +</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ports</td>
<td>+ -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airports</td>
<td>+ -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICT</td>
<td>+</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>+ +/-</td>
<td>x</td>
<td>x?</td>
<td>x?</td>
</tr>
<tr>
<td>Sanitation</td>
<td>+ +</td>
<td>x</td>
<td></td>
<td>x?</td>
</tr>
</tbody>
</table>

The major infrastructure services do not in general have strong public goods elements. None of the services listed here are “non-rival” in the sense that supply of the good is unaffected by the number of users (although given the indivisibilities inherent in many kinds of infrastructure investment, there may be significant ranges over which the use of the infrastructure by one user does not significantly impact on its use by others, for instance use of a bridge or road – beyond a certain level of use however, congestion effects become significant).
The ability to exclude non-paying users is in technical and economic terms a fairly straightforward issue for most of the types of infrastructure service considered here. For roads and related transport infrastructure, and for some aspects of water supply and sanitation services, the cost of collecting payment directly from users (metering of water use by individual users, collecting road tolls on minor roads) rather than through general taxation may be a relatively high proportion of the value of the service provided and so in practice the collection cost may make private provision with direct cost recovery unviable. However, Srinivasa-Raghavan (2001) argues that political imperatives not to exclude sections of the population from access on the grounds of inability to pay, or ideological commitments to the idea that certain services should be free or heavily subsidised at the point of delivery, mean that (p. 16) “certain types of infrastructure [services] have acquired the characteristics of public goods.” Electricity, water and some transport services are particularly likely to be viewed in this way.

Asymmetric information between users and providers at the level of service provision (relating specifically to whether the quality of the service being provided is better known to the service provider than to the consumer) is not a major issue in relation to any of the services (with the exception of water in relation to contamination). By contrast, information asymmetries between the provider and regulator are extremely important in relation to the quality of the investment (e.g. the quality of road construction) and in relation to determining costs, in cases where regulation of monopoly provision requires some estimate of an appropriate long-term return on capital invested.

The significance of widening the perspective from physical infrastructure to the regulatory framework and performance of related markets, and the need for an integrated perspective across sectors and sub-sectors is illustrated by Carruthers et al. (2003) which sets out an agenda for key reforms and investments to improve trade and logistics within the region. A main point is that physical infrastructure is only one part of an agenda that requires coordinated transport regulation across sectors and countries, removal of ports from congested urban areas, integration of ports and land transport networks and the provision of supporting logistics – including warehouses, cold storage, inter-modal terminals, information to control flows. They note that comparative performance of ports are largely determined by regulatory and policy issues such as customs clearance procedures, container tracking capability, and the extent to which there is an effective integrated framework for developing transport and trade corridors.

C. Poverty and Infrastructure

Three broad types of definition of poverty may be considered as potentially relevant in examining the linkages between infrastructure investment and poverty:

- The narrowest definition relates to income and livelihoods, captured for example in the “dollar a day” international poverty line.
- A wider definition based on the Millennium Development Goals that also encompasses education, health, and access to water and sanitation services.
- Definitions based on enhancing human capabilities, freedoms and social inclusion (as discussed in Klitgaard, 2004, for example).
Contribution of Infrastructure to Growth and Poverty Reduction

Impact on poverty defined according to the income/livelihood definition will depend first on the extent to which improved infrastructure services reduce the costs faced by the poor for services or competing alternatives that they already use, so directly boosting their real income, and second on the extent to which improved services create employment possibilities (by encouraging investment and growth) or enhance the productivity of assets to which the poor have access (for instance access roads will increase the economic value of land). The extent of these benefits will depend on the capacity that poor people have to benefit from the opportunities created (for instance as a result of their level of education and skills), and the security of their control of their assets (so that increased land value does not lead to land-grabbing by the politically influential).

Impact on poverty defined according to the second (MDG-based) definition will additionally occur to the extent that improved infrastructure services improve access to education and health services (transport, communications, and power infrastructure are likely to play roles here) as well as the impact of improved water and sanitation services on health.

Impact according to the third (empowerment or capability-based) definition is likely to be more difficult to define and measure, however transport and communications infrastructure can improve capacity to engage in collective activities and access to wider sources of information and opportunity, while improved power, water and transport services in particular can free time for both economic and non-economic purposes (particularly for women in cases where they bear principal responsibility for water and energy provision for the household). However, the literature on gender impacts of infrastructure investments highlights the importance of "moving beyond a gender perspective that simply focuses on enhancing women's capacity for productive work, to one that addresses the equity dimensions of gender relations and pursues the economic, social and political empowerment of women" (ADB 2003a, p. 24).

The nature of poverty in a particular country or location will be significant for assessing the likely impact of infrastructure investment as an anti-poverty strategy, in comparison to alternative strategies. The following cases may be distinguished:

- Where there is mass poverty, affecting large proportions of the population throughout the country, infrastructure investment will be an important part of a broader strategy for poverty reduction and economic growth, though precise priorities will vary depending on the context.

- Where poverty is highly location-specific (for instance in remote highland areas) and clearly linked to geographical remoteness or poor access to key services (for instance water supply and sanitation in urban slums), a targeted strategy of improving infrastructure provision to areas of high poverty concentration may be the single most important element of a poverty reduction strategy.

- Where poverty affects a relatively limited proportion of the population and depends on factors other than those directly related to geographical remoteness (for instance factors like caste, histories of discrimination against particular ethnic groups, cultural or other factors that have limited education attainment or employment opportunities for certain

---

7 In both money and, in some cases more significantly, time.

8 This ADB review notes that there has been little published research focusing on the gender distribution of transportation and energy investments in particular, though that a significant body of work in this area is under way.
Contribution of Infrastructure to Growth and Poverty Reduction

groups), and particularly where this poverty is not geographically concentrated, infrastructure investment may not form an important part of a poverty reduction strategy.

D. Direct and Indirect Impacts of Infrastructure

The impact on the poor of improved infrastructure services may be defined as direct or indirect, according to whether it derives from the use of the services (participation in the market) by poor people themselves, or by others (such as potential investors whose activities may create jobs). It is also important to distinguish the time-frames under which impacts are likely to occur since in many cases it is reasonable to expect that lags will be extremely long.

The direct or indirect impact of the service must also be distinguished from the impact of the investment itself (both the initial investment and its maintenance). The main positive direct impact of an infrastructure investment is likely to relate to the creation of employment opportunities. Negative direct impacts may be environmental or social.9 Indirect impacts from the investment are likely to relate mainly (a) to multiplier effects that may affect employment and (b) the fiscal impact of the investment.

The extent of the direct impact on the poor as consumers of infrastructure services will depend on:

- The extent to which access to services is improved, costs reduced and quality improved – which depends both on the infrastructure investment and the operation of the market for the services provided.10 Typically some form of alternative competing service provides a benchmark (e.g. purchase of water from private vendors or wells, the use of wood, batteries or gas containers as energy sources compared to mains electricity or gas).

- The extent of opportunities that are opened up by improved infrastructure access. In particular, the potential labour market to which poor people have access may be enlarged (by improved transport and communications). This may facilitate permanent or temporary outmigration and the provision of remittances to family members remaining in the home area, or allow longer-distance commuting to employment.11

- The terms of access and cost of the services that the poor face. Typically there are important economies of scale in the provision of infrastructure services to households or communities (relating in particular to the need for particular equipment for users and the costs of

---

9 The Background Paper for this study on Environmental and Social Aspects (Warford, 2004) addresses these issues.

10 Assessing the performance of these markets as it impacts on the poor depends in principle on examining the types of market failure to which it may be prone, and the impact of public action in either overcoming or exacerbating market failures. The type of analysis required in assessing how market performance impacts on the poor is set out in OPM (2000). An important issue in principle is the extent to which the mode of regulation of the market for the service (and the planning and decision-making process relating to siting and other investment decisions) is sensitive to the interests of the poor, or indeed involves direct accountability to poor users. There is evidence for example that increased involvement of poor people in this level of decision-making may enhance their willingness to pay for services.

11 Social and economic constraints may militate against the ability of the poor to take advantage of wider labour market opportunities. Examples may include indebtedness and consequent labour duties to, and dependence on, landlords or a lack of resources to bear the risks involved in seeking new employment elsewhere or embarking on a new economic venture.
monitoring use of the service), so that on fully economic pricing, the unit costs faced by the poor for service use will be higher than those faced by richer users. High upfront connection charges may be a particular deterrent to access.

- The income elasticity of demand for the service (and its current share in the expenditure patterns of the poor). More generally, particular sub-groups of the poor in different contexts are likely to have different needs for, and current use of, infrastructure services.

While all the poor are potential direct consumers of infrastructure-related services, some of the poor are also producers of closely competing services (e.g. water carriers, porters). Some groups among the poor may therefore lose livelihood opportunities, at least in the short-term, as a result of increased competition in the markets in which they are sellers.

The indirect impacts of improved infrastructure service provision on the poor are mediated through other markets. In some of these markets, poor people are purchasers. For example, improved road transport may lead to falls in the price of staple foods and consumer goods imported to the region that are purchased by the poor. Reduced energy costs may lead to falls in the price of locally manufactured goods that are purchased by the poor. The willingness of service suppliers such as doctors and teachers to locate in an area may also be positively affected by improved infrastructure.

The deeper and more long-term impact will depend on the impact on markets in which the poor are sellers – of goods and services that they produce (particularly for agricultural producers), but most fundamentally of their labour. The impact of improved infrastructure service provision on the demand for the labour of the poor locally will depend on its boosting the productivity of investment in the areas where the poor are located (or to which they have access), through both lowering input costs and expanding the potential market. This impact will not necessarily be positive at least not in the short-term – for instance improved transport links (particularly if not linked to other forms of infrastructure investment) might lower the cost of bringing goods into the area that compete with local products and thereby undermine local employment. For example, a vicious circle may be conceived where improved transport infrastructure undermines local production and reduces the cost of supply of goods, encouraging out-migration of the most talented and dynamic workers and a remittance-based economy for those who remain. Such a development might be associated with severe clusters of poverty among those without access to remittances or the resources or skills to migrate. Improved transport and communications may also expose isolated communities to cultural influences with which they may be poorly equipped to cope, while patterns of the development of HIV/AIDS epidemics have often been closely linked to major transport routes.

In the longer-term, this indirect mechanism through the creation of labour market opportunities (as part of a broader process of economic growth) is likely to be the most important. However it is much more difficult to measure this and to isolate the impact of specific infrastructure investments on poverty than is the case for most direct impacts, for several reasons:

- Indirect impacts (even more than direct impacts) depend on the complementarity of infrastructure investments. An improved road without power or communications infrastructure may have little effect in improving the productivity of investment in a remote location.

- Wider considerations relating to the investment environment (macroeconomic management, governance, international market developments) will also impact on investment decisions affecting labour demand.
• The scope for poor people to take advantage of employment and other economic opportunities will also depend on their human capital in terms of health and education status.

A further indirect channel links infrastructure to poverty through the public finances. Two links determine this. First, the public finance impact of infrastructure investment and service provision decisions (for example to cover the capital cost of public investments and subsidies for service provision), and conversely the impact of changes in the overall fiscal stance on public infrastructure investment levels and composition. Second, the impact of changes at the margin in the public finances (principally expenditure) on the poor. To the extent that infrastructure provision is dependent on public financing, governments will face a sharp trade-off between expenditure on investment or subsidies related to infrastructure, and spending in other areas with potential poverty impact such as education and health. The size of the fiscal impact of infrastructure spending depends in part on its accounting treatment, particularly in the case of countries operating against ceilings on variables like the overall fiscal balance. IMF (2004a) notes the concern that approaches to fiscal policy that focus on the overall fiscal balance and gross public debt may excessively constrain productive public investment. IMF (2004b) by contrast notes that standard accounting treatments of Public-Private Partnerships may understate the fiscal implications of these arrangements, particularly in cases where the public sector continues to bear a considerable portion of the risk. As noted in Section 4C below, the burden of fiscal adjustment in practice tends to fall more than proportionately on public infrastructure investment with a potentially severe impact of growth and poverty.

Figure 1: Summary of Conceptual Framework

Figure 1 shows the main causal linkages that are relevant to identifying the direct and indirect impacts of infrastructure investment and services on the poor. Government regulatory and financial policies impact on infrastructure investment decisions and the market for infrastructure service, as well as on enterprises that use the services and on poor people, while the infrastructure policies and decisions also impact on government finances.
Table 3: Potential Positive Impacts of Infrastructure Services on the Poor

<table>
<thead>
<tr>
<th>Sector</th>
<th>Direct Impact on Poor</th>
<th>Indirect Impacts on Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Electric) Power</td>
<td>Mainly for lighting, TV, radio at low levels of income.</td>
<td>Reduced energy costs for enterprises encouraging employment creation across wide range of activities</td>
</tr>
<tr>
<td></td>
<td>Heating, cooking, appliances for self-employment at higher levels of income</td>
<td>Improved health and other services (refrigeration, lighting etc)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improves ICT access</td>
</tr>
<tr>
<td>Piped gas</td>
<td>Limited impact at low income levels</td>
<td>Reduced energy costs for enterprises encouraging employment creation (limited range of activities)</td>
</tr>
<tr>
<td></td>
<td>Heating, cooking at higher levels of income</td>
<td></td>
</tr>
<tr>
<td>Roads</td>
<td>Access to employment and markets</td>
<td>Reduced transport costs and improved market access for enterprises and service providers, lowering costs of serving remote communities</td>
</tr>
<tr>
<td></td>
<td>Access to services (health, education)</td>
<td></td>
</tr>
<tr>
<td>Railways</td>
<td>Limited</td>
<td>Reduced costs and improved market access for enterprises</td>
</tr>
<tr>
<td>Urban Mass Transit (UMT)</td>
<td>Access to employment opportunities</td>
<td>Employment creation from more efficient labour markets</td>
</tr>
<tr>
<td>Ports</td>
<td>Limited</td>
<td>Reduced transport costs for enterprises encouraging employment creation (e.g. bulk commodities like agriculture)</td>
</tr>
<tr>
<td>Airports</td>
<td>Limited</td>
<td>Reduced transport costs for enterprises encouraging employment creation (high value low bulk commodities, and services)</td>
</tr>
<tr>
<td>Information and Communications Technology (ICT)</td>
<td>Better communication access, aiding migration, information on opportunities, access to knowledge and potential engagement in wider communities</td>
<td>Employment creation through improved knowledge of markets, reduced management supervision costs, access to wider knowledge base</td>
</tr>
<tr>
<td>Water</td>
<td>Improved health outcomes</td>
<td>Limited</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Improved health outcomes</td>
<td>Improved health outcomes (e.g. reduced pollution by non-poor households and others)</td>
</tr>
</tbody>
</table>

12 Although water and sewerage systems have different characteristics, they tend to be operated by a single company and therefore it is best to treat them together. The main infrastructure components are:

Water: raw water abstraction and raw water treatment; transmission and distribution.
Sewerage: waste water collection, sewage treatment and disposal, sludge treatment and disposal.
Table 3 provides a preliminary and summary representation of the major direct and indirect (positive) impacts of infrastructure service on the poor excluding those related to public finances that depend mainly on subsidy policies. Several general points can be made that set the scene for more detailed discussion of issues within the region:

- In terms of direct impact on the poor, water and sanitation services (mainly through their impact in improving health outcomes), roads, ICT and electric power are likely in general to be of the greatest significance.

- Indirect impacts are more difficult to assess and highly context-specific, but depend on the growth and employment generation impact – in the short-term in particular on the types of investment that are facilitated in relation to their demand for labour.

- ICT, electric power and road transport are likely to be of particular significance in relation to wider empowerment-based concepts of poverty.

### E. Accountability and Political Factors

Of central importance to determining the impact of infrastructure investment and service provision on the poor is the extent to which the interests and voices of the poor are able to exert influence over decision-making at each stage from the planning of investments through construction to maintenance and regulation, and at each level of decision-making from the international (e.g. policies of development agencies) to the local (e.g. the composition and interests of community bodies managing local water supplies). Understanding the political economy of decision-making processes and the role and influence of different stakeholders within these processes is a necessary part of an analysis of infrastructure-poverty linkages. Important elements include the following:

- The motivations and timeframes governing the decisions of politicians and policy-makers. To the extent that the time horizons of political decision-makers are short, and their concerns focused on rent-seeking or the maintenance of patrimonial networks, rather than long-term and on effective service delivery, the development and poverty impact of public decision-making in relation to infrastructure is likely to be problematic. Large public infrastructure projects are likely to become a major focus of rent-seeking activity, and siting and other decisions will be influenced by often short-term political considerations. Since infrastructure investment typically creates a monopoly for the infrastructure owner, private investments will also become a focus of rent-seeking behaviour – this may involve particular political interests seeking a share of the monopoly rent that is created, or predation of the assets of private investors whose costs are largely sunk. Public infrastructure agencies will be subject to similar and typically more severe pressures.

- Even where political objectives are generally developmental, there may be significant conflicts between perceived national development objectives and the interests of some or all poor people. Where the perceived interests or voices of some or all poor people are influential in decision-making, this may still not lead to optimal choices of policy, particular in an environment where it is difficult for credible political commitments to be made. For example, mass political parties or NGOs with an important poor constituency may resist reforms that raise service tariffs to economic levels because of concerns that the increased...
Contribution of Infrastructure to Growth and Poverty Reduction

tariffs will not in fact lead to improved services. In addition, the interests of different groups of poor people are not homogenous and may be in conflict.

- Srinivasa-Raghavan (2001) notes that in many countries the pricing of certain infrastructure services is highly politically sensitive and that policy makers have to balance constraints on the level of prices that are politically acceptable against the costs of bureaucracy and the risk of underinvestment because of insecure property rights. He argues that the Indian experience has been that “the ‘more’ democracy you have in a country with a very large number of poor people, the higher the need for redistribution” (p.11) and therefore that these costs have been high.

**Figure 2: Accountability Mechanisms in Infrastructure Services**


The 2004 World Development Report sets out a useful framework for analysing and understanding the role and influence of different interests in service provision through the identification of alternative accountability mechanisms. These are summarised in Figure 2.

An accountability relationship is conceived as having five elements (WDR, 2004, p. 48):

1. Delegation – an explicit or implicit understanding that a service will be supplied.
2. Financing – provision of the resources to enable the service to be provided.
3. Performing – supplying the service.
4. Information about Performance – obtaining relevant information and evaluating performance against expectations or formal or informal norms.
5. Enforcing – being able to impose sanctions or rewards to influence performance.
The main feature of this framework is a distinction between two routes of accountability – the “short route” between the users of services and the service provider, which will operate mainly through market mechanisms, and the “long route” through the representation of the interests of users of services to politicians and policy-makers, and the mechanisms by which they in turn are able to exert influence over the providers of infrastructure services. Typically in relation to infrastructure investments and services, both forms of accountability are required. The short route of accountability through market mechanisms will be more effective the greater the degree of competition and the stronger the budget disciplines under which the provider operates (which is likely to be stronger in private than public providing agencies). The concept of a “Compact” composed of relationships of accountability necessary for increasing the power of incentives for good performance between policymakers and providers is seen as particularly important.

The framework also highlights the significant issues of agency and representation and organisation of interests within each interest group as well as between them. The interests of the poor (particularly in highly unequal societies or where the poor are a small proportion of the total population) will receive little weight in accountability through market mechanisms than the interests of better-off service users because of their lack of relative purchasing power, but their interests may be even less effectively represented through the political process. The extent to which effective coalitions of interest between the poor and potentially more influential non-poor groups can be formed will be of great significance for the extent to which the interests of the poor are reflected in decision-making.

In cases where the prospects for market-based “short route” accountability are limited, politicians have also to be capable of effectively exerting influence over policymakers and regulators to ensure that they are accountable for their decisions against clearly defined objectives. A tension may therefore exist between the need for regulatory agencies to have independence to guard against political interference in decision-making, and the need for accountability within these agencies, particularly in contexts where legal and constitutional institutions are relatively weak. At the level of the service provider, the management of the organisation needs also to be both sensitive to the market signals received and capable of ensuring quality of service and controlling rent-seeking behaviour by its agents.

WDR (2004) in its discussion of infrastructure issues notes that the water and electricity sectors have proved to be particularly vulnerable to patronage politics, and that a major danger is of providers being more accountable to policy-makers than to their clients, in a context where rent-seeking and patronage concerns are dominant in policy-making. It therefore argues that establishing a clear separation between provider and policy-maker is likely to be a first step in rebalancing accountability, and the role of decentralisation of decision-making (e.g. making service and political boundaries coincide more closely and allowing benchmarking performance) and increased private participation as mechanisms for achieving this separation is discussed. In each case it is noted that there are pitfalls and practical difficulties in using these reform measures to improve accountability, and that the wider institutional framework including the political culture will shape the range of outcomes that are possible. The relationship between formal political structures and effective accountability is complex, and issues relating to the timeframe under which decision-makers operate and the formal and informal accountability mechanisms involved in decision-making are particularly important.
3. Poverty and Infrastructure in East Asia and the Pacific - Overview

This section presents a summary of information relating to poverty and access to infrastructure in the region, with a view to identifying the main features of poverty (especially in relation to their linkages to infrastructure) and the policy challenges facing governments in the region.

A. Features of Poverty in the Region

Measured in terms of the international poverty line of USD 1 per day (PPP)\textsuperscript{13}, East Asia – dominated by PRC - has achieved a reduction in poverty over the last two decades that is historically unprecedented in its scale and speed. Table 4 summarises information on those countries for which estimates are available, comparing 1990 and 2000. The largest country for which data is lacking is Myanmar. All the countries achieved a significant reduction in poverty over the decade, despite the impact of economic crisis that affected several countries (especially Indonesia and Thailand) especially severely at the end of the decade and evidence that the poverty impact of growth is falling as income inequality increases, particularly in the fastest-growing countries (OPM, 2003).

Table 4: Poverty Incidence – International $1/Day Definition

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>48.3</td>
<td>35.5</td>
<td>4.4</td>
<td>4.3</td>
</tr>
<tr>
<td>PRC</td>
<td>30.8</td>
<td>16.1</td>
<td>371.5</td>
<td>215.9</td>
</tr>
<tr>
<td>Indonesia</td>
<td>20.6</td>
<td>16.3</td>
<td>36.7</td>
<td>33.6</td>
</tr>
<tr>
<td>Lao, PDR</td>
<td>53.0</td>
<td>34.6</td>
<td>2.2</td>
<td>1.8</td>
</tr>
<tr>
<td>Malaysia</td>
<td>0.5</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>PNG</td>
<td>23.7</td>
<td>18.5</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Philippines</td>
<td>19.1</td>
<td>13.2</td>
<td>11.7</td>
<td>10.1</td>
</tr>
<tr>
<td>Thailand</td>
<td>12.5</td>
<td>5.2</td>
<td>7.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Vietnam</td>
<td>50.8</td>
<td>23.6</td>
<td>33.6</td>
<td>18.5</td>
</tr>
</tbody>
</table>


\textsuperscript{13} There are significant problems associated with the use of the international poverty line, particularly relating to the choice of deflator to make the purchasing power parity adjustment. In a number of cases (most notably China) national poverty lines are significantly different. However the international line has been used here for comparative purposes.
Table 5: Performance Against Selected MDGs, 2001

<table>
<thead>
<tr>
<th>Country</th>
<th>Prevalence of Child Malnutrition (%)</th>
<th>Net Primary Enrolment (%)</th>
<th>Ratio of Girls:Boys in Primary and Secondary Education (%)</th>
<th>Under Five Mortality / thousand</th>
<th>Maternal Mortality / hundred thousand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>45.2</td>
<td>86.2</td>
<td>83.9</td>
<td>135</td>
<td>450</td>
</tr>
<tr>
<td>PRC</td>
<td>10.0</td>
<td>92.8</td>
<td>(1995) 95.1</td>
<td>40</td>
<td>56</td>
</tr>
<tr>
<td>Indonesia</td>
<td>24.6</td>
<td>92.1</td>
<td>98.0</td>
<td>48</td>
<td>230</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>40.0</td>
<td>82.8</td>
<td>83.0</td>
<td>105</td>
<td>650</td>
</tr>
<tr>
<td>Malaysia</td>
<td>(1995) 20.1</td>
<td>95.2</td>
<td>104.4</td>
<td>9</td>
<td>41</td>
</tr>
<tr>
<td>Mongolia</td>
<td>12.5</td>
<td>86.6</td>
<td>111.7</td>
<td>78</td>
<td>110</td>
</tr>
<tr>
<td>Myanmar</td>
<td>(1995) 42.9</td>
<td>81.9</td>
<td>98.0</td>
<td>110</td>
<td>360</td>
</tr>
<tr>
<td>PNG</td>
<td>..</td>
<td>77.5</td>
<td>97.0</td>
<td>95</td>
<td>300</td>
</tr>
<tr>
<td>Philippines</td>
<td>(1995) 29.6</td>
<td>93.0</td>
<td>102.3</td>
<td>40</td>
<td>200</td>
</tr>
<tr>
<td>Thailand</td>
<td>(1995) 17.6</td>
<td>86.3</td>
<td>95.4</td>
<td>29</td>
<td>44</td>
</tr>
<tr>
<td>Vietnam</td>
<td>33.8</td>
<td>94.0</td>
<td>92.7</td>
<td>30</td>
<td>130</td>
</tr>
<tr>
<td>Fiji</td>
<td>(1995) 7.9</td>
<td>99.8</td>
<td>103.0</td>
<td>22</td>
<td>75</td>
</tr>
<tr>
<td>Kiribati</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>70</td>
<td>..</td>
</tr>
<tr>
<td>Marshall Is.</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>68</td>
<td>..</td>
</tr>
<tr>
<td>FS Micronesia</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>24</td>
<td>..</td>
</tr>
<tr>
<td>Palau</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>29</td>
<td>..</td>
</tr>
<tr>
<td>Samoa</td>
<td>4.2</td>
<td>93.9</td>
<td>102.6</td>
<td>26</td>
<td>130</td>
</tr>
<tr>
<td>Vanuatu</td>
<td>(1995) 12.1</td>
<td>93.2</td>
<td>..</td>
<td>44</td>
<td>130</td>
</tr>
</tbody>
</table>
Over 70% of those below the international poverty line in the region are in China.\footnote{This proportion is highly dependent on the poverty line used and the basis for comparison. For example, Ravallion and Chen (2004) present data that for their preferred poverty line measure, the proportion below the poverty line fell from 53% in 1981 to 8% in 2001, with the rural proportion being 12.5% (from 65% in 1981) and the urban proportion 0.5% (6% in 1981). Over the same period, the urban share of population increased from 20% to 39%. They do not attempt to relate their poverty line to the international poverty line.} A feature of China’s experience since 1978 is that there has been a move from growth that was initially strongly agriculture-based and rural (the result of liberalisation of agricultural marketing and decollectivization and the release of suppressed urban demand) towards a growth path that is associated with rapid increases in inequality (the Gini coefficient increased from 28.8 in 1981 to 41.5 in 1995). As a result, the poverty reduction impact of growth has tended to slow. Chen and Wang (2001) note that “income disparities in China come largely from two sources: income gaps between rural and urban sectors; and those between coastal and inland regions.” Rozelle et al. (2003) argue that “at present… most of the rural poor are concentrated in resource deficient areas, and comprise entire communities located mostly in upland sections of the interior provinces of northern, northwestern and southwestern China.” Changes in agricultural policies after 1996 have led to relative stagnation or even reductions in agricultural incomes, particularly in poor inland regions such as Gansu, Heilongjiang, Shanxi and Xinjiang. Benjamin et al. (2003) using village level data over 9 provinces for 1987-99 argue that “distribution has worsened significantly since 1995, with rising inequality, and falling absolute incomes, especially at the bottom end of the income distribution.” This is attributed to collapsing agricultural incomes, with access to non-agricultural income sources being a significant factor in explaining divergence. Benjamin et al. (2004) further find evidence that inequality adversely affects development of the non-agricultural sector.

Ravallion and Chen (2004) using newly assembled distributional data over the period 1980-2001 conclude that:

- Growth in rural areas accounted for most of the gains to the poor, though migration to urban areas was also a contributory factor for poverty reduction, with agricultural growth being the most important for poverty reduction.

- Poverty reduction has been greatly slowed by rising inequality within the rural sector, and there was only a slight fall in the incidence of poverty in rural China between 1996 and 2001.

- Provinces starting with relatively high inequality saw slower progress in poverty reduction.

Since the mid-1990s, urban poverty has become an increasingly significant factor (with the total numbers of urban poor being highest in the east)\footnote{Direct comparisons between urban and rural poverty incidence rates are difficult to make in China because of differences in the poverty line used between urban and rural areas and in different cities – urban poverty lines are generally substantially higher (ADB, 2004c). The National Bureau of Statistics has recently introduced a poverty line that is close to the USD 1 per day poverty line (Spencer, 2004).}, although the bulk of the poor remain concentrated in rural areas. Urban poverty is associated with unemployment, disability and migration from rural areas (Zhou, 2000) – so that the causes of urban and rural poverty are inextricably mixed.

\footnote{Ethnic minorities (non-Han) who comprise 13% of the total population are disproportionately located in these areas.}
In relation to measures of performance against the MDGs, China’s performance has been strong in education enrolment and in gender equality in education, as well as in reducing infant, child, and especially maternal mortality. However, net primary enrolment has stagnated and may even have fallen back between 1990 and 2001 (ADB, 2004). Health and education indicators are substantially worse for low-income households.

While access to infrastructure services is relatively good (with the main exception of sanitation and with particularly good road access\textsuperscript{17}), there are large differentials in access between urban and rural populations, and within the rural population between poor and non-poor households. 66\% of the rural non-poor and 58\% of the poor have access to safe water, while 90\% of the non-poor are in villages with a telephone compared to 77\% of the poor.

**Cambodia’s** violent history has contributed to high levels of poverty associated with isolation due to the breakdown of infrastructure\textsuperscript{18}, internal displacement and victims of violence. Although poverty incidence fell significantly over the 1990s as greater peace and security was established, it remains the highest in the region and is allied to chronic food insecurity. Poverty is concentrated in rural areas (over 90\% of the poor). Lack of access to land is a major contributing factor to rural poverty, including as a result of insecure occupancy (World Bank, 2000c). Education and health indicators are also among the lowest in the region.

**Indonesia’s** success in poverty reduction was temporarily reversed following the economic crisis of 1998, although there is evidence that after more than doubling during that year, poverty incidence rates rapidly fell again. The majority of poor people are in rural areas of Java – however the rates of incidence of poverty are widely scattered across the country with incidence rates highest in the eastern islands. In total 78\% of the poor are in rural areas (World Bank, 2003h). There are strong correlations between income and non-income forms of poverty, while Indonesia performs relatively poorly in relation to health and education performance compared to other countries in the region (for example maternal mortality is five times higher than in Vietnam). Urban poverty is closely related to unemployment, with female urban unemployment especially high. Vulnerability to shocks is a particular factor, with a large cluster of household just above the poverty line.

Poverty in the **Philippines** was also adversely affected by the regional economic crisis, with poverty increasing between 1997 and 2000 (World Bank, 2002b). Rates of poverty incidence are three times as high in rural as in urban areas, and the highest rates of incidence are in the Autonomous Region of Muslim Mindanao (ARMM), Bicol, Western Mindanao and Eastern Visayas. The underlying causes of poverty are heavy dependence on agriculture, lack of adequate social safety nets, and lack of educational achievement. Health and education indicators are substantially weaker for the poor.

In **Thailand**, likewise, economic crisis temporarily reversed gains in poverty reduction, and by 2003 poverty incidence remained above pre-crisis levels, and again a large number of households are clustered just above the poverty line. Ninety percent of the poor are in rural areas, and two-thirds of the poor are in the rural northeast. Income inequality has also worsened significantly over the last two decades (World Bank, 2003a).

\textsuperscript{17} 93\% of the poor and 96\% of the non-poor in rural areas live in villages connected to a highway.

\textsuperscript{18} World Bank (2000c) notes that “the secondary [road] network is in a derelict state, virtually blocking access to rural areas.”
Vietnam’s poverty reduction achievement has been the proportionately most striking in the region with poverty more than halving between 1990 and 2000. Ninety percent of the poor are in rural areas, and 80% have a household head working in agriculture on very small landholdings or landless (OPM, 2003). The poor are disproportionately likely to come from ethnic minorities and not to have completed primary education. Poverty incidence is highest in the Northern Uplands (accounting for 28% of the total), Central Highlands and North Central Province (18%), although in terms of absolute numbers the Mekong Delta has the second highest number of poor (21%). Vietnam has a relatively equal income distribution, which did not worsen significantly over the 1990s at least until a slowing of agricultural growth rates at the end of the decade. Vietnam has notably good health and education indicators for its level of per capita income, with a high level of gender equality in education and a strong improvement in child and infant mortality.

For other countries in the region less information is available but some points can be made:

- For Mongolia, its large size, low population density and hostile climate pose particular problems for service provision and livelihood opportunities for the rural population. This has led to substantial migration to urban areas and the result, unique within the region, that poverty incidence is higher in urban than rural areas.

- The Pacific Island states have traditionally had strong networks of support and resource sharing. However these have come under increasing strain as a result of population growth and other factors. There are now strong trends towards increasing inequality and growing problems of urban unemployment and poverty. Papua New Guinea, Solomon Islands, and Vanuatu also have to varying degrees problems of ethnic division, conflict, and low levels of education attainment and poor health status.

- In Timor-Leste, poverty incidence is estimated at 40% (World Bank, 2003f), with over 85% of the poor in rural areas. Poverty is concentrated among those with low educational status, and lack of access to assets or infrastructure. Access to education and health status are significantly lower than in neighbouring countries.

Despite the diversity of countries within the region, clear common patterns emerge in relation to the nature of the poverty problem and underlying trends:\(^{19}\)

- There has been substantial progress in poverty reduction, though this has slowed as a result of (a) in some countries, depressed economic performance following the 1998 crisis and (b) in countries where growth has been maintained, a move towards less pro-poor patterns of growth, in particular a less favourable environment for agriculture than in earlier years.\(^{20}\)

---

\(^{19}\) UN Millennium Project (2004, p6) , reviewing overall performance against the MDGs concludes for East Asia that “progress is lagging in several dimensions of poverty reduction: health, gender equality, basic infrastructure, and environmental sustainability.”

\(^{20}\) This represents a change from the patterns of growth enjoyed by the currently more developed countries in the region during their periods of most rapid expansion (for example Korea, Chinese Taipei, Malaysia, Japan) when typically inequality fell (OPM, 2003). Mody (1997, ppix-xii) argues that infrastructure investment was a key feature of this pattern of growth: “This sustained commitment to high quality infrastructure was the product of a long-range vision: to maintain the region’s competitiveness in export markets, to attract foreign investment in the region
• Poverty is overwhelmingly located in rural areas, and is associated with dependence on agriculture, low educational attainment, and location in economically lagging regions (often highland, inland or outlying islands) which frequently have disproportionate numbers of people from ethnic minorities.

• There is substantial year to year movement of households around the poverty line, so it is typically the case that a far larger number of households fall intermittently below the poverty line than are permanently below it.\(^{21}\)

• Urban poverty is however becoming more significant and is increasing its share of total poverty (and apparently increasing in absolute numbers in some cases). Urban poverty is associated with unemployment and concentrated on recent migrants from rural areas.

• There is a high degree of correlation between income/consumption poverty and other aspects of poverty and deprivation including health status, access to education, and access to infrastructure.

• Significant proportions of the population in several countries are located just above the poverty line and are therefore highly vulnerable to adverse shocks, in a context where safety net arrangements are extremely weak.

• Legacies of conflict and insecurity have a particularly adverse impact on poverty.

\section*{B. Infrastructure Provision and Access}

Comparative data across a large number of countries on infrastructure provision and access is limited to a relatively small number of variables. For access, this is limited effectively to improved water and sanitation and electricity. For levels of provision, the main information available is on roads and telecommunications. Data is not readily available in this form at the subnational level, which would be particularly useful for understanding poverty linkages – where such data is available it typically shows substantial inequalities between sub-national regions (see for example, Table 11 for China). Disaggregation by urban/rural status and income quintile also typically shows high levels of variation.\(^{22}\)

Table 6 presents data on transport infrastructure. In relation to road density, Mongolia, Papua New Guinea\(^ {23}\), Myanmar, and Solomon Islands are particularly poorly served in terms of both density and road quality. Thailand and China also have relatively low road density but with a much higher quality of roads. The Philippines and Vietnam have substantially denser road networks than the

\footnotesize

\(^{21}\) For example, Spencer (2004) quotes a panel data study of Sichuan which found over a five year period that 30% of households fell below the poverty line in at least one year, while only 2.4% were below the poverty line in all five years, and the average number below the poverty line was 11-14%.

\(^{22}\) For example, for Cambodia survey data for 2000 showed that 54 percent of poor rural households relied on pump or well as a source for water supply compared with 15 and 6 percent respectively of rich rural and urban households. According to the 1998 Census, only 23.7 percent of rural households have access to safe drinking water, compared with 80 percent of urban households. For the poorest 20 percent of the rural population, the percentage with access to safe water falls to 4 percent (CSR, 2002).

\(^{23}\) Carruthers et al. (2003) draw particular attention to the economic costs caused by the poor state of repair of the Highlands Highway, the main road corridor for minerals and coffee exports from PNG.
other countries (excluding some of the small islands), though with lower rates of road paving. In relation to road density, Mongolia, Papua New Guinea, Myanmar, Solomon Islands, are particularly poorly served in terms of both density and road quality. Thailand and China also have relatively low road density but with a much higher quality of roads.

Table 6: Indicators of Transport Infrastructure Provision

<table>
<thead>
<tr>
<th></th>
<th>Roads/ person (m/ pc)</th>
<th>Road Density (km/km²)</th>
<th>Road % paved</th>
<th>Roads/ person (m/ pc)</th>
<th>Road Density (km/km²)</th>
<th>Road % paved</th>
<th>Rail Density (km/ 000 km²)</th>
<th>Airports /1000 sq km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>1.0</td>
<td>0.07</td>
<td>69</td>
<td>3.9</td>
<td>0.20</td>
<td>75</td>
<td>3.4</td>
<td>22.1</td>
</tr>
<tr>
<td>PRC</td>
<td>1.1</td>
<td>0.15</td>
<td>91</td>
<td>1.0</td>
<td>0.13</td>
<td>..</td>
<td>6.3</td>
<td>27.1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1.7</td>
<td>0.19</td>
<td>46</td>
<td>1.6</td>
<td>0.16</td>
<td>46</td>
<td>2.9</td>
<td>32.8</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>4.1</td>
<td>0.09</td>
<td>45</td>
<td>3.4</td>
<td>0.06</td>
<td>24</td>
<td>..</td>
<td>25.3</td>
</tr>
<tr>
<td>Malaysia</td>
<td>2.8</td>
<td>0.20</td>
<td>76</td>
<td>4.7</td>
<td>0.26</td>
<td>70</td>
<td>4.9</td>
<td>63.7</td>
</tr>
<tr>
<td>Mongolia</td>
<td>20.5</td>
<td>0.03</td>
<td>4</td>
<td>20.1</td>
<td>0.03</td>
<td>10</td>
<td>1.2</td>
<td>4.5</td>
</tr>
<tr>
<td>Myanmar</td>
<td>0.6</td>
<td>0.04</td>
<td>..</td>
<td>0.6</td>
<td>0.04</td>
<td>11</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>PNG</td>
<td>3.8</td>
<td>0.04</td>
<td>4</td>
<td>4.6</td>
<td>0.04</td>
<td>3</td>
<td>0.0</td>
<td>..</td>
</tr>
<tr>
<td>Philippines</td>
<td>2.6</td>
<td>0.68</td>
<td>21</td>
<td>2.6</td>
<td>0.54</td>
<td>..</td>
<td>1.7</td>
<td>113.3</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.9</td>
<td>0.11</td>
<td>99</td>
<td>1.3</td>
<td>0.14</td>
<td>55</td>
<td>7.9</td>
<td>75.9</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1.2</td>
<td>0.29</td>
<td>25</td>
<td>1.5</td>
<td>0.30</td>
<td>24</td>
<td>9.7</td>
<td>75.9</td>
</tr>
<tr>
<td>Fiji</td>
<td>4.2</td>
<td>0.19</td>
<td>49</td>
<td>4.1</td>
<td>0.17</td>
<td>45</td>
<td>0.0</td>
<td>..</td>
</tr>
<tr>
<td>Micronesia</td>
<td>2.0</td>
<td>..</td>
<td>18</td>
<td>..</td>
<td>..</td>
<td>16</td>
<td>0.0</td>
<td>..</td>
</tr>
<tr>
<td>Samoa</td>
<td>4.6</td>
<td>0.28</td>
<td>42</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>0.0</td>
<td>..</td>
</tr>
<tr>
<td>Solomon Is</td>
<td>3.2</td>
<td>0.05</td>
<td>3</td>
<td>3.8</td>
<td>0.03</td>
<td>2</td>
<td>0.0</td>
<td>..</td>
</tr>
<tr>
<td>Tonga</td>
<td>6.7</td>
<td>0.94</td>
<td>27</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>0.0</td>
<td>..</td>
</tr>
<tr>
<td>Vanuatu</td>
<td>5.2</td>
<td>0.09</td>
<td>24</td>
<td>..</td>
<td>..</td>
<td>22</td>
<td>0.0</td>
<td>..</td>
</tr>
</tbody>
</table>

Source: WDI (2004), Data relates to 2000 or the nearest date for which data is reported. Data on airport density from Carruthers et al (2003). Data on road network length for Cambodia, Malaysia and Thailand all show a large (step) reduction in the road network, suggesting a data revision.
Comparison of changes over the period since 1990 are made more difficult by apparent data revisions affecting some of the countries, but only Lao PDR shows a substantial increase in both road density and quality over the period.

Table 7 presents data on electricity. In relation to access to mains electricity, PRC, Malaysia and Mongolia have rates in excess of 90% of households, while in Cambodia the rate is 15% and in Myanmar only 5%. Access to electricity is almost universal (98%) in urban areas in East Asia, and access is relatively high by comparison with other developing regions in rural areas (81%) – this compares with figures of 68% and 30% respectively in South Asia. However, despite this, reliance on biomass fuels for cooking and heating remains extensive – estimated at 56% of the population in the People’s Republic of China, 74% in Indonesia, and 37% in the rest of East Asia (Saghir, 2004). All the countries for which data is available per capita electricity consumption increased substantially over the 1990s – more than tripling in Vietnam and more than doubling in Malaysia, Thailand and Indonesia. The rate of growth was much more modest in Myanmar and the Philippines. As a proxy for the quality of supply, transmission and distribution losses saw substantial reductions in Vietnam, Thailand and Indonesia, but increases in Myanmar and the Philippines.

Table 7: Electricity Consumption, Losses and Electrification Rates

<table>
<thead>
<tr>
<th>Country</th>
<th>Electric Power Consumption (Kwh pc)</th>
<th>Transmission and Distribution Losses (%)</th>
<th>Electric Power Consumption (Kwh pc)</th>
<th>Transmission and Distribution Losses (%)</th>
<th>Electrification Rates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>1990</td>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>15</td>
</tr>
<tr>
<td>PRC</td>
<td>424</td>
<td>6.9</td>
<td>827</td>
<td>6.9</td>
<td>99</td>
</tr>
<tr>
<td>Indonesia</td>
<td>156</td>
<td>14.8</td>
<td>384</td>
<td>11.3</td>
<td>53</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1095</td>
<td>9.0</td>
<td>2628</td>
<td>8.0</td>
<td>96</td>
</tr>
<tr>
<td>Mongolia</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>90</td>
</tr>
<tr>
<td>Myanmar</td>
<td>43</td>
<td>26.4</td>
<td>69</td>
<td>31.3</td>
<td>5</td>
</tr>
<tr>
<td>PNG</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Philippines</td>
<td>342</td>
<td>12.8</td>
<td>477</td>
<td>14.0</td>
<td>68</td>
</tr>
<tr>
<td>Thailand</td>
<td>690</td>
<td>10.6</td>
<td>1448</td>
<td>7.9</td>
<td>82</td>
</tr>
<tr>
<td>Vietnam</td>
<td>94</td>
<td>24.2</td>
<td>286</td>
<td>13.4</td>
<td>75</td>
</tr>
</tbody>
</table>

### Table 8: Expansion of Telephone Access (per thousand people) 1990-2002

<table>
<thead>
<tr>
<th>Country</th>
<th>1990</th>
<th>Mobile</th>
<th>Total</th>
<th>2000</th>
<th>Mobile</th>
<th>Total</th>
<th>2002</th>
<th>Mobile</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>0.4</td>
<td>0.0</td>
<td>0.4</td>
<td>2.4</td>
<td>10.0</td>
<td>12.3</td>
<td>2.6</td>
<td>27.6</td>
<td>30.1</td>
</tr>
<tr>
<td>PRC</td>
<td>5.9</td>
<td>0.0</td>
<td>5.9</td>
<td>111.8</td>
<td>65.8</td>
<td>177.6</td>
<td>166.9</td>
<td>160.9</td>
<td>327.8</td>
</tr>
<tr>
<td>Indonesia</td>
<td>5.9</td>
<td>0.1</td>
<td>6.0</td>
<td>32.3</td>
<td>17.8</td>
<td>50.1</td>
<td>36.5</td>
<td>55.2</td>
<td>91.7</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>1.6</td>
<td>0.0</td>
<td>1.6</td>
<td>7.8</td>
<td>2.4</td>
<td>10.2</td>
<td>11.2</td>
<td>10.0</td>
<td>21.2</td>
</tr>
<tr>
<td>Malaysia</td>
<td>89.3</td>
<td>4.9</td>
<td>94.2</td>
<td>199.2</td>
<td>220.1</td>
<td>419.3</td>
<td>190.4</td>
<td>376.8</td>
<td>567.2</td>
</tr>
<tr>
<td>Mongolia</td>
<td>32.0</td>
<td>0.0</td>
<td>32.0</td>
<td>49.5</td>
<td>65.2</td>
<td>114.6</td>
<td>52.7</td>
<td>88.9</td>
<td>141.6</td>
</tr>
<tr>
<td>Myanmar</td>
<td>1.7</td>
<td>0.0</td>
<td>1.7</td>
<td>5.7</td>
<td>0.3</td>
<td>5.9</td>
<td>7.0</td>
<td>1.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>8.0</td>
<td>0.0</td>
<td>8.0</td>
<td>12.6</td>
<td>1.7</td>
<td>14.3</td>
<td>11.7</td>
<td>2.7</td>
<td>14.5</td>
</tr>
<tr>
<td>Philippines</td>
<td>10.0</td>
<td>0.0</td>
<td>10.0</td>
<td>40.0</td>
<td>84.4</td>
<td>124.4</td>
<td>41.7</td>
<td>191.3</td>
<td>232.9</td>
</tr>
<tr>
<td>Thailand</td>
<td>24.3</td>
<td>1.2</td>
<td>25.4</td>
<td>92.3</td>
<td>50.4</td>
<td>142.7</td>
<td>105.0</td>
<td>260.4</td>
<td>365.5</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1.5</td>
<td>0.0</td>
<td>1.5</td>
<td>31.9</td>
<td>9.9</td>
<td>41.7</td>
<td>48.4</td>
<td>23.4</td>
<td>71.8</td>
</tr>
<tr>
<td>Fiji</td>
<td>57.6</td>
<td>0.0</td>
<td>57.6</td>
<td>106.6</td>
<td>67.9</td>
<td>174.6</td>
<td>119.0</td>
<td>109.7</td>
<td>228.7</td>
</tr>
<tr>
<td>Kiribati</td>
<td>16.6</td>
<td>0.0</td>
<td>16.6</td>
<td>39.6</td>
<td>4.7</td>
<td>44.3</td>
<td>51.1</td>
<td>6.2</td>
<td>57.3</td>
</tr>
<tr>
<td>Marshall Islands</td>
<td>11.2</td>
<td>0.0</td>
<td>11.2</td>
<td>75.9</td>
<td>8.5</td>
<td>84.4</td>
<td>77.4</td>
<td>9.8</td>
<td>87.2</td>
</tr>
<tr>
<td>FS Micronesia</td>
<td>25.0</td>
<td>0.0</td>
<td>25.0</td>
<td>84.1</td>
<td>0.0</td>
<td>84.1</td>
<td>..</td>
<td>14.8</td>
<td>..</td>
</tr>
<tr>
<td>Samoa</td>
<td>25.6</td>
<td>0.0</td>
<td>25.6</td>
<td>48.2</td>
<td>14.1</td>
<td>62.3</td>
<td>56.9</td>
<td>15.0</td>
<td>71.8</td>
</tr>
<tr>
<td>Solomon Islands</td>
<td>14.7</td>
<td>0.0</td>
<td>14.7</td>
<td>18.2</td>
<td>2.7</td>
<td>21.0</td>
<td>44.9</td>
<td>2.2</td>
<td>17.1</td>
</tr>
<tr>
<td>Tonga</td>
<td>45.8</td>
<td>0.0</td>
<td>45.8</td>
<td>98.4</td>
<td>1.8</td>
<td>100.2</td>
<td>112.9</td>
<td>33.8</td>
<td>146.7</td>
</tr>
<tr>
<td>Vanuatu</td>
<td>17.8</td>
<td>0.0</td>
<td>17.8</td>
<td>34.6</td>
<td>1.9</td>
<td>36.5</td>
<td>32.7</td>
<td>24.2</td>
<td>56.9</td>
</tr>
</tbody>
</table>

Source: WDI (2004)

There is also extremely wide variation in telephone mainline provision, as shown in Table 8. Here countries are clustered into three categories on the basis of data for 2000: less than 20/1000
(Cambodia, Lao PDR, Myanmar, Papua New Guinea, Solomon Islands), 30-50/1000 (Indonesia, Mongolia, Philippines, Vietnam, Samoa, Vanuatu) and over 80/1000 (China, Malaysia, Thailand, Micronesia, Tonga). However, the situation in relation to telephone access is changing extremely rapidly in most countries in the region primarily as a result of the expansion of mobile networks, though the fixed line network in China increased by almost 50% over those two years. Thailand saw telephone access (fixed or mobile) increase from 142.7 per thousand people in 2000 to 365.5 in 2002. Over the period from 1990 to 2002, access to telecommunications services has been transformed across the region – with increases of more than fiftyfold in telephones per capita in Cambodia, China and Vietnam and for than fifteenfold in Indonesia, the Philippines and Thailand. Exceptions are Papua New Guinea, Myanmar and Solomon Islands, which are lagging, while growth in telecommunications access in the small Pacific Island countries has also generally been more modest.

As shown in Table 9, access to improved water sources for rural households is in the range from 66-81% for the larger countries in the region, with the exception of Malaysia where the rate is 94%. Cambodia, Lao PDR, Mongolia and PNG have rates in the range 26-32%. Vietnam achieved an increase in the percentage of households with access to improved water sources from 48% to 72% between 1990 and 2000. Of the other countries for which data comparing 1990 and 2000 is available, rates of increase were much more modest, with the percentage falling in the Philippines. While urban rates were substantially higher than rural rates, these fell over the period in China and Indonesia, presumably reflecting rapid rates of urbanisation that have exceeded capacity to provide access to services for all newcomers.
### Table 9: Access to Improved Water Sources, 1990 and 2000

<table>
<thead>
<tr>
<th>Country</th>
<th>1990</th>
<th>Rural (%)</th>
<th>Urban (%)</th>
<th>2000</th>
<th>Rural (%)</th>
<th>Urban (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>30</td>
<td>26</td>
<td>54</td>
</tr>
<tr>
<td>PRC</td>
<td>71</td>
<td>60</td>
<td>99</td>
<td>75</td>
<td>66</td>
<td>94</td>
</tr>
<tr>
<td>Indonesia</td>
<td>71</td>
<td>62</td>
<td>92</td>
<td>78</td>
<td>69</td>
<td>90</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>37</td>
<td>29</td>
<td>61</td>
</tr>
<tr>
<td>Malaysia</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>94</td>
<td>..</td>
</tr>
<tr>
<td>Mongolia</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>60</td>
<td>30</td>
<td>77</td>
</tr>
<tr>
<td>Myanmar</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>72</td>
<td>66</td>
<td>89</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>42</td>
<td>32</td>
<td>88</td>
<td>42</td>
<td>32</td>
<td>88</td>
</tr>
<tr>
<td>Philippines</td>
<td>87</td>
<td>82</td>
<td>93</td>
<td>86</td>
<td>79</td>
<td>91</td>
</tr>
<tr>
<td>Thailand</td>
<td>80</td>
<td>78</td>
<td>87</td>
<td>84</td>
<td>81</td>
<td>95</td>
</tr>
<tr>
<td>Vietnam</td>
<td>55</td>
<td>48</td>
<td>86</td>
<td>77</td>
<td>72</td>
<td>95</td>
</tr>
<tr>
<td>Fiji</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>43</td>
<td>12</td>
<td>75</td>
</tr>
<tr>
<td>Kiribati</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>48</td>
<td>25</td>
<td>82</td>
</tr>
<tr>
<td>Palau</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>79</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Samoa</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>99</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>Solomon Islands</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>71</td>
<td>65</td>
<td>34</td>
</tr>
<tr>
<td>Tonga</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Vanuatu</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>88</td>
<td>94</td>
<td>63</td>
</tr>
</tbody>
</table>

Source: WDI (2004). Data relates to 2000 or the nearest year for which data is reported.
Table 10: Access to Improved Sanitation, 1990 and 2000

<table>
<thead>
<tr>
<th>Country</th>
<th>Improved sanitation (total %)</th>
<th>Improved sanitation (rural %)</th>
<th>Improved sanitation (urban %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>17</td>
<td>10</td>
<td>56</td>
</tr>
<tr>
<td>PRC</td>
<td>29</td>
<td>18</td>
<td>57</td>
</tr>
<tr>
<td>Indonesia</td>
<td>47</td>
<td>38</td>
<td>66</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>30</td>
<td>19</td>
<td>67</td>
</tr>
<tr>
<td>Malaysia</td>
<td></td>
<td></td>
<td>98</td>
</tr>
<tr>
<td>Mongolia</td>
<td>30</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td>Myanmar</td>
<td>64</td>
<td>57</td>
<td>84</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>82</td>
<td>80</td>
<td>92</td>
</tr>
<tr>
<td>Philippines</td>
<td>74</td>
<td>63</td>
<td>85</td>
</tr>
<tr>
<td>Thailand</td>
<td>79</td>
<td>75</td>
<td>95</td>
</tr>
<tr>
<td>Vietnam</td>
<td>29</td>
<td>23</td>
<td>52</td>
</tr>
<tr>
<td>Fiji</td>
<td>47</td>
<td>51</td>
<td>43</td>
</tr>
<tr>
<td>Kiribati</td>
<td>48</td>
<td>44</td>
<td>54</td>
</tr>
<tr>
<td>Palau</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Samoa</td>
<td>99</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>Solomon Islands</td>
<td>34</td>
<td>18</td>
<td>98</td>
</tr>
<tr>
<td>Tonga</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vanuatu</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: WDI (2004). Data relates to 2000 or the nearest date for which data is reported.

Access to improved sanitation increased substantially over the 1990s in Thailand, Vietnam, and China, and more modestly in the other countries for which data is available, but is still below 30% for the rural populations of Mongolia, Cambodia, Solomon Islands, Lao PDR and China.\(^{24}\)

\(^{24}\)The interpretation of the data requires some care and further examination. For example while the reported WDI data show 93% of urban households in the Philippines with access to improved sanitation, WSP
Table 11: China – Regional Differences in Rural Infrastructure

<table>
<thead>
<tr>
<th>Province</th>
<th>Road density</th>
<th>Electricity use</th>
<th>Rural telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>km/10,000 km²</td>
<td>kW/person</td>
<td>Set/10,000 people</td>
</tr>
<tr>
<td></td>
<td>km/10,000 labor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>km/10,000 person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National</td>
<td>1679</td>
<td>260</td>
<td>303</td>
</tr>
<tr>
<td>Beijing</td>
<td>6310</td>
<td>709</td>
<td>1024</td>
</tr>
<tr>
<td>Tianjin</td>
<td>5258</td>
<td>844</td>
<td>625</td>
</tr>
<tr>
<td>Hebei</td>
<td>3021</td>
<td>252</td>
<td>222</td>
</tr>
<tr>
<td>Shanxi</td>
<td>3578</td>
<td>309</td>
<td>205</td>
</tr>
<tr>
<td>Inner Mongolia</td>
<td>484</td>
<td>150</td>
<td>229</td>
</tr>
<tr>
<td>Liaoning</td>
<td>2985</td>
<td>375</td>
<td>502</td>
</tr>
<tr>
<td>Jilin</td>
<td>2136</td>
<td>184</td>
<td>286</td>
</tr>
<tr>
<td>Heilongjiang</td>
<td>1200</td>
<td>177</td>
<td>388</td>
</tr>
<tr>
<td>Shanghai</td>
<td>17676</td>
<td>1771</td>
<td>2767</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>6863</td>
<td>453</td>
<td>604</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>3505</td>
<td>525</td>
<td>596</td>
</tr>
<tr>
<td>Anhui</td>
<td>4905</td>
<td>113</td>
<td>160</td>
</tr>
<tr>
<td>Fujian</td>
<td>4305</td>
<td>383</td>
<td>735</td>
</tr>
<tr>
<td>Jiangxi</td>
<td>3529</td>
<td>115</td>
<td>109</td>
</tr>
<tr>
<td>Shandong</td>
<td>6358</td>
<td>287</td>
<td>242</td>
</tr>
<tr>
<td>Henan</td>
<td>4382</td>
<td>195</td>
<td>111</td>
</tr>
<tr>
<td>Hubei</td>
<td>4199</td>
<td>182</td>
<td>319</td>
</tr>
<tr>
<td>Hunan</td>
<td>4633</td>
<td>129</td>
<td>171</td>
</tr>
<tr>
<td>Guangdong</td>
<td>3843</td>
<td>625</td>
<td>1258</td>
</tr>
<tr>
<td>Guangxi</td>
<td>2287</td>
<td>114</td>
<td>97</td>
</tr>
<tr>
<td>Hainan</td>
<td>51</td>
<td>63</td>
<td>163</td>
</tr>
<tr>
<td>Chongqing</td>
<td>22</td>
<td>159</td>
<td>121</td>
</tr>
<tr>
<td>Sichuan</td>
<td>2050</td>
<td>165</td>
<td>88</td>
</tr>
<tr>
<td>Guangxi</td>
<td>3210</td>
<td>172</td>
<td>101</td>
</tr>
<tr>
<td>Gansu</td>
<td>1300</td>
<td>190</td>
<td>81</td>
</tr>
<tr>
<td>Qinghai</td>
<td>207</td>
<td>273</td>
<td>247</td>
</tr>
<tr>
<td>Ningxia</td>
<td>1082</td>
<td>161</td>
<td>104</td>
</tr>
<tr>
<td>Xinjiang</td>
<td>277</td>
<td>159</td>
<td>172</td>
</tr>
</tbody>
</table>

Source: Fan and Zhang (2004). For road density, Hainan and Chongqiing included in Guangdong and Sichuan respectively.

Table 11 gives an indication of the geographical differences in infrastructure provision in China – differences are greater at the sub-provincial level but even at the provincial level the range of difference is greater than that between the countries in the region.

The overall picture for infrastructure access for the region may be summarised as follows:

(2003b) reports for the Philippines that fewer than 8% of households in Metro Manila have sewer connections and that only three out of 1500 cities and towns have functioning public sewer systems.
• There is a high degree of variation in infrastructure access both between countries and within countries. Within countries, rural areas substantially lag urban in all dimensions of infrastructure access.

• Several countries (notably China and Vietnam) have achieved rapid expansion in infrastructure access across most or all dimensions and are closing the gap on the South East Asian countries where rates of progress (outside the telecommunications sector) have been relatively modest.

• While the data is difficult to interpret and cross-sectoral comparisons are problematic, progress in road access and quality appears to be slower than in other sectors. Improvements in water and sanitation also appear to be relatively slow.

• Cambodia and Lao PDR appear to be making significant progress but from a much lower base. Carruthers et al. (2003) report for Laos that “almost 40 percent of villages are more than 6 km from a main road, half are not accessible during the rainy season, one quarter of the district centers lack year-round road access and a quarter of provincial and local roads cannot be used during the rainy season.” They also note that freight rates over a distance of 100 km in Cambodia can vary by a factor of almost 350% depending on road conditions.

• Some other countries (Myanmar, PNG, some of the Pacific Island states) are stagnant or making much less progress in terms of infrastructure indicators.

• New investment and technological advances (facilitated by regulatory reforms) have led to a revolution in access to telephone communications, which are now penetrating into rural areas as costs fall. However nothing like the rate of technological change that has made this possible is in prospect for the other infrastructure sectors.

25 Vietnam’s Comprehensive Poverty Reduction and Growth Strategy (CPRGS) sets out a clear agenda of priorities for poverty-focused infrastructure policy. The elements are: Continue reforming, upgrading and expanding the existing essential infrastructure facilities and develop new ones (small irrigation schemes, schools, commune health clinics, rural roads, electricity for lighting purposes, clean water for livelihood purposes, markets, commune cultural and postal offices, meeting rooms, etc.) to ensure that 80% of poor communes are provided with adequate essential infrastructure by 2005 and 100% by 2010; Expand the national transmission grid to reach centers of 900 poor communes by 2005 and ensure that 90% of communes are provided with electricity; Ensure the provision of car-accessible roads connecting to commune centers; Strive to ensure that 80% of commune roads have appropriate road surface structure, of which 30% are paved with asphalt or cement; Ensure that 80% of the urban population, especially those living far from the major transport roads, and 60% of the rural population have access to clean water with an average daily supply of 50 liters per person, and 50% households have toilets that meet basic sanitation standards by 2005; Attach importance to ensuring sufficient provision of clean water facilities and environmental sanitation in nursery schools, kindergartens, schools, health clinics in rural areas; Ensure that 85% of the rural population has access to clean water with an average daily supply of 60 liters per person and 75% households have toilets that meet basic sanitation standards by 2010; Pay special attention to enabling poor households to access clean water (Socialist Republic of Vietnam, 2002).

26 Ure (2004) provides case study examples showing that expansion of telecommunications into rural areas is becoming economically viable for service providers in a number of countries such as the Philippines, but problems of cost of service supply remain a barrier in remoter and poorer rural areas. The bulk of the growth that has occurred to date has been in urban areas.
4. Evidence on Infrastructure-Poverty Linkages

This section reviews evidence on the linkages between infrastructure and poverty reduction, covering both direct and indirect effects, drawing where possible on studies focusing on the East Asia and Pacific region, but also on wider studies. Three main types of study can be distinguished:

- Studies that measure the relationship between infrastructure variables and growth or poverty indicators using estimates of production functions at the national or sub-national level.
- Impact studies that focus on particular investments using a wider variety of quantitative and qualitative analysis methods.
- Studies that focus not on investment impacts but on the way in which institutional and policy factors have affected the provision of infrastructure and the access that the poor have to it. These are particularly valuable for assessing the implications of reforms, including for example increasing the role of the private sector.

A. Modelling Infrastructure Impact on Growth and Poverty

The first type of study uses econometric methods to examine the relationship between economic outcome measures (for example, growth, poverty incidence, inequality, and in some cases other types of outcome measure such as health status) and measures of infrastructure provision – either in terms of physical quantities, or (public) expenditure, generally based on estimation of an explicit production function in which infrastructure variables are included as factors of production. This literature began with the work of Aschauer (1989) and has developed using cross-country panel data and more sophisticated econometric techniques that allow for the possible endogeneity of infrastructure investment decisions, as well as time lags. A number of studies (Canning, 1999; Demetriades and Mamuneas, 2000; Röller and Waverman, 2001, Fernald 1999) have confirmed the significant impact of infrastructure (especially telecommunications and roads) on output, mainly using data for OECD countries.

A related approach (Canning and Bennathan, 2000) uses data on infrastructure stock and costs and an estimated production function to calculate rates of return on investment in these sectors compared to overall capital investment. While rates of return to each type of investment are similar in OECD countries (suggesting that the overall allocation of investment is appropriate, for many developing countries (particularly middle-income ones) the rates of return on infrastructure investment are substantially higher than for investment in general, suggesting that there has been underinvestment in infrastructure (particularly for roads, while in poorer countries the main underinvestment is in electricity).

Among studies focusing on economic growth rates, Easterly and Rebelo (1993) found that public expenditure on transport and communications significantly raises economic growth, though Devarajan, Swaroop and Zhou (1996) found the relationship between the share of infrastructure expenditure in total public expenditure and economic growth to be negative for a sample of

\[27\] This discussion draws on the useful summaries of this literature in Calderón and Servén (2004) and Willoughby (2002). This empirical literature does not always specify the causal links by which growth or poverty reduction impact is occurring, but it in principle captures both direct and indirect effects, with the main focus being on the latter.
developing countries.\textsuperscript{28} A number of studies have found that measures of telephone density are important in explaining differences in growth performance between countries. Bougheas et al. (2000) model the link between infrastructure and growth through infrastructure investment allowing greater specialisation of production and hence improvements in efficiency. They found using developing country data that growth returns to investment in transport and telecommunications infrastructure were likely to be particularly high for the poorer countries.

Studies focusing on the relationship between infrastructure development and the welfare of the poor, focusing on infrastructure’s role in enabling poor individuals and lagging areas to participate in economic opportunities through expanding their access to markets, and reducing production and transactions costs. As Ali and Yao (2004) note:

“Markets in many countries are fragmented due to poor infrastructure connections. Markets with poor infrastructure can coordinate supply and demand only with a limited geographic area. The high cost of moving goods and providing services becomes a barrier to trade on a large scale. Poor transport and communications services inhibit the efficient flow of information among market participants, especially those in distant locations. Small market size and the lack of interconnectivity with outside markets limit the scope for productivity improvements and commercial production.”

Estache and Fay (1995) for example show that enhanced access to roads and sanitation has been an important determinant of economic convergence for the poorest regions in Argentina and Brazil. Studies of rural roads (e.g. Jacoby, 2000) have shown how they raise the productivity and value of land for poor farmers. Studies have also shown the positive impact of expanding infrastructure services on the child and maternal mortality and educational attainment. For example, there is evidence that a better transportation system and safer roads increase school attendance and electricity allows more time for study, while water and sanitation access has a well documented effect in reducing infant and child mortality – with estimates of a quarter of the difference in infant mortality and 37\% of that in child mortality between the rich and the poor being explained by access to water services (Leipziger, Fay, Wodon and Yepes, 2003). Leipziger et al. also find that there are important positive interaction effects between types of intervention. Estache (2004) notes however that there has been little research attention in general to the infrastructure requirements for achieving the MDGs.

A recent study by Calderón and Servén (2004) focuses on explaining both GDP growth and inequality using a large panel data set including more than 100 countries over the period 1960-2000, and composite measures of both the stock of infrastructure and its quality\textsuperscript{29} and represents the most comprehensive analysis covering developing countries. Their main empirical findings are that:

\textsuperscript{28} A re-examination of the Easterly and Rebelo study using a larger and more recent dataset suggested firmer conclusions about the positive effect of overall public investment as well as infrastructure on growth (Miller and Tsoukis, 2001).

\textsuperscript{29} Measures used for the infrastructure stock are the number of main telephone lines (quality – waiting time for lines), electricity generating capacity of the economy (quality - percentage of transmission and distribution losses), and road density (quality - share of paved roads in total). Attempts to model the contribution of individual infrastructure components are made difficult by the high correlation between infrastructure measures. Aschauer (1998) using data on 46 developing countries for 1970-90 found that there was a significant growth effect for both quantity and quality measures, though this was reduced to the extent that foreign debt was used as a form of finance.
• The size of infrastructure stocks has a statistically significant positive effect on long-run economic growth – a conclusion that is robust to changes in the infrastructure measure and the estimation method.\textsuperscript{30}

• Infrastructure quantity and quality have a robust negative impact on income inequality. Improved access to safe water has an additional positive impact on income equality.

• The results are obtained in a framework that controls for reverse causation suggesting that there is a clear causal impact of infrastructure on growth and income equality.

They argue on the basis of illustrative experiments based on the empirical results that the parameters estimated imply substantial payoffs in terms of growth and inequality reduction from increases in the infrastructure stock in poorer countries to benchmark levels achieved by other similar countries. They summarise their overall findings as follows (p. 27):

“Finally, and perhaps most importantly, the conclusion that infrastructure both raises growth and lowers income inequality implies that infrastructure development may be a key win-win ingredient for poverty reduction. In addition to raising society’s overall level of income, it would help raise the income of the poor more than proportionately. This suggests that infrastructure development should rank at the top of the poverty reduction agenda.”

Prud’homme (2004) notes a number of difficulties for this production-function based approach, in addition to those of determining causation and simultaneity that improvements in econometric techniques have sought to address, particularly the difficulty of valuing the inventory of infrastructure, and the heterogeneity of infrastructure from the viewpoint of its relationship to economic development, and especially from the fact that infrastructure investment decisions are far more likely to be influenced by non-economic factors than is the case with other forms of investment. A further problem is that what matters directly for economic development is infrastructure usage, while most available information relates to infrastructure supply – as noted earlier it is inherent in the concept of infrastructure that there can be large and long-lived discrepancies between supply and demand. Given these considerations, he concludes that the general finding of positive rates of return in terms of growth from infrastructure investment is quite encouraging while suggesting that from an economic point of view there is likely to have been substantial underinvestment in some forms of infrastructure.

Studies using these approaches at the sub-national level in individual countries are particularly interesting because they allow for controls of some of the policy and institutional factors that are constant at the national level. Work by IFPRI, initially on data at state level in India and province level in China and subsequently in other countries, has been particularly influential. It has examined the impact of different forms of public expenditure on rural poverty and agricultural GDP.\textsuperscript{31} Table 5 shows the estimated poverty impact in different regions of China of different forms

\textsuperscript{30} The empirical link with the quality measure is less robust, possibly because quality and quantity are strongly correlated.

\textsuperscript{31} Several caveats are required in drawing policy conclusions from analysis of this type that calculates poverty or growth rates of return from different forms of investment. In particular, in addition to the importance of the policy framework within which investment occurs, one would expect on theoretical grounds that the relative rates of return would depend on the current stock of the different forms of capital as well as on the current investment (and maintenance) flow, and not to be constant over a wide range of investment levels, and to be particularly high where there are investment bottlenecks. Such studies alone are also of limited guidance to public investment decisions since they do not examine whether such expenditures need
of rural public expenditure (measured in terms of the poverty impact of alternative forms of rural public investment).

Table 12: Poverty Impact of Alternative Forms of Rural Public Investment in China

<table>
<thead>
<tr>
<th></th>
<th>Coastal</th>
<th>Central</th>
<th>Western</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural R&amp;D</td>
<td>1.99</td>
<td>4.40</td>
<td>33.12</td>
<td>6.79</td>
</tr>
<tr>
<td>Irrigation</td>
<td>0.55</td>
<td>0.77</td>
<td>4.06</td>
<td>1.33</td>
</tr>
<tr>
<td>Roads</td>
<td>0.83</td>
<td>3.61</td>
<td>10.73</td>
<td>3.22</td>
</tr>
<tr>
<td>Education</td>
<td>2.73</td>
<td>5.38</td>
<td>28.66</td>
<td>8.80</td>
</tr>
<tr>
<td>Electricity</td>
<td>0.76</td>
<td>1.65</td>
<td>6.17</td>
<td>2.27</td>
</tr>
<tr>
<td>Telephone</td>
<td>0.60</td>
<td>1.90</td>
<td>8.51</td>
<td>2.21</td>
</tr>
<tr>
<td>Poverty Loans</td>
<td>0.88</td>
<td>0.75</td>
<td>1.49</td>
<td>1.13</td>
</tr>
</tbody>
</table>

Source: Fan (2001)

For China, rural roads emerge empirically as the form of infrastructure spending that has the greatest impact, though returns to education and agricultural research and development emerge as the most effective way to use public expenditure to reduce rural poverty. In India, by contrast, expenditure on rural roads emerges as the most effective. Fan and Zhang (2004) note two main conclusions from the estimation of production functions for different regions of China:

“First, rural infrastructure and education play a more important role in explaining the difference in rural non-farm productivity than agricultural productivity. Because the rural non-farm economy is a major determinant of rural income, investing more in rural infrastructure is key to an increase in overall income of the rural population. Second, the lower productivity in the western region is explained by its lower level of rural infrastructure, education, and science and technology. Therefore, improving both the level and efficiency of public capital in the west is a must to narrow its difference in productivity with other regions.”

The robustness of the finding of a significant impact of rural (and especially all-weather, paved) roads on poverty reduction emerges from a number of other studies within the region:

32 Fan, Zhang and Zhang (2002) found that increases in road density had significant effects on agricultural GDP per worker, non-agricultural employment and agricultural wages. Jalan and Ravallion (2002) also found for China that a 1% increase in road km/per capita led to an increase in household consumption of 0.08%.

33 Luo (2004) shows that geographical position was a significant factor in explaining differences in growth rates between provinces in China from 1979-99. Her analysis suggests though that improvement in transportation infrastructure in central hubs (Hubei, Henan and Hunan) will have a greater effect on development in Western China than the same level of investment within Western China itself.
Kwon (2000) found for Indonesia that the poverty impact of growth was almost four times higher in provinces with high levels of road provision compared to those with poor levels of provision. A more disaggregated analysis using district-level data (Balisacan, Pernia and Asra, 2002) found a significant effect of roads on the incomes of the poor.

Balisacan and Pernia (2002) found similar results for the Philippines using provincial data, but also found that the impact is increased if coupled with education investment.

Glewwe, Gragnolati and Zaman (2002) found the poor households living in rural communes with paved roads in Vietnam had 67% higher probability of escaping poverty than those in communes without paved roads.

Cook (2003) summarising studies on China, India, Thailand and Indonesia on determinants of rural poverty reduction concludes that the consistent finding is that investment in roads and education have been the main drivers of rural poverty reduction (with agricultural research and development also important in those studies where it has been examined). The poverty impact of irrigation and power investments has been positive but significantly smaller. Studies on the impact on income of electricity investment in the Philippines (Balisacan and Pernia, 2003) conclude that there is little effect for the poorest, and suggest that some minimum level of income and of access to complementary facilities is required for households to benefit from electricity.

Empirical estimation of the relationship between infrastructure and growth is however complicated by a number of factors:

- Many infrastructure investment decisions are not based solely on considerations of maximising economic growth impact, but are taken for a variety of political and social reasons.
- Measuring the infrastructure stock is difficult both conceptually and practically, particularly because of its long-lived nature.
- It is anyway the flow of services from the stock of infrastructure that determines its economic contribution. This is also difficult to measure, particularly since infrastructure investments can be underutilised or overutilised for long periods of time in a way that is unlikely to the case with other forms of capital good.
- The efficiency with which infrastructure services are supplied depends also on the regulatory framework governing service provision.

B. Impact Studies

The second source of information on the poverty impact of infrastructure relates to case studies of particular areas or projects. The advantage of this approach is that it can yield very rich and

---

34 Saghir (2004) notes the following widespread myths about energy and poverty: that biomass energy is free and so the poor are insensitive to energy prices, that when the poor do pay for energy it is cheap compared to modern energy sources, and that the introduction of access to modern energy will be a panacea, kick-starting socioeconomic development.
detailed information on the different channels by which both direct and indirect impacts occur, as well as highlighting the importance of the policy and institutional factors determining the performance of markets for infrastructure services, particularly in relation to the level and terms of access to the service for the poor (direct effects). The type of conclusions that can be drawn from impact case studies are however limited by the difficulty in establishing appropriate controls (before/after, with/without) or of generalising beyond the particular cases examined. A review by ADB (Duncan, 2004) of case studies of the impact of transport and energy investments concluded that they “tended to be subjective or lacked a reliable method for separating out the impacts due to transport or energy” with the methodological problems in identifying the impact on poverty of large-scale investments like expressways being particularly intractable. Songco (2002) reviewing case studies on rural infrastructure investments drew similar conclusions about the lack of established methodologies that systematically examined linkages. Briceño et al (2004) report an average rate of return of 35.3% (ranging from 18.6% for water and sanitation to 43.3% for transport) for World Bank infrastructure projects disbursing at least 95% of loan commitments between 1999 and 2003, though they also note that there is “no systematic consistency in the rigor and assumptions made on common issues across sectors” (Estache, 2004, p.5).

An ADB impact study of transport and energy investment in China, India and Thailand (ADB 2003a) found that:

- Improvements in transport infrastructure led to significant changes in the use of transport, while electricity when it became available was used mainly for lighting, television and other appliances, while its use for income-generating activities required complementary equipment that was generally beyond the reach of the poor. In both sectors, the regulatory framework and the extent of competition or tariff policy impacted on usage.

- In all three country case studies, significant income and poverty reduction effects were found as a result of transport investment (especially paved roads), with electrical connection having a markedly lesser effect.

- Again, in all three cases there was substantially improved access to education and health facilities leading to improved school attendance (particularly for girls in India), better trained teachers being willing to locate, and better health status, although there were concerns about increases in road accidents. Electricity provided more time for study and improving hygiene through refrigeration.

- Time savings were particularly valued by the poor, while there appeared to be strong complementarities between different types of investment.

---

35 An example of a “before and after” study in Siem Reap province in Cambodia showed that after rural roads were rehabilitated and maintained: (1) traffic doubled on rural roads (motorised traffic increased by 10%), (2) trip numbers from rural areas to community centres increased by 20%, (3) travel time decreased by 43% (from one hour to 25 minutes), (4) fare costs decreased by 38%, (5) there was a 103 percent increase in the goods transported along the rural roads, and (6) trade activities in rural markets increased by 600 % (CSD, 2002).

36 Londero (2003) sets out a framework using the example of transport to provide a more complete approach to cost-benefit analysis capturing distributional effects.
Contribution of Infrastructure to Growth and Poverty Reduction

- Substantial community level changes were reported including new village markets, increased availability of goods, greater capacity to access work, increased social participation (in politics and community bodies), improved security and access to common resources.

ADB (2002), which involves a number of case studies of rural road investments in Indonesia, the Philippines and Sri Lanka, shows the value of in-depth case studies using a variety of methodologies including participatory assessments and a multi-dimensional concept of poverty. Conclusions included the following:

- In all the examples studied the poor and very poor benefited substantially from improved access to state services in areas such as health, education, agricultural extension and provision of information, and reduced perceptions of isolation and remoteness.

- The scale of economic impact was determined by factors including climate, agricultural potential, spatial position and proximity to networks, world market prices as well as social structure and concentration of assets.

- Economic benefits differed greatly between socioeconomic groups, with the poor benefiting particularly from improved access for health and social reasons in times of need, while improvements in transport within villages (paths, tracks, culverts) being potentially of more direct value than access to motorised transport. Generally the poorest were not equipped (in terms of access to capital or capacity to bear risk) to exploit the economic opportunities that improved transport links created.  

- Roads (provided that they had all-year accessibility) improved access to alternative livelihood opportunities, which provided an important economic safety net, though it also increased exposure to potentially negative influences from nearby urban centres.

- The extent to which reductions in vehicle operating costs were passed on as cheaper transport services depended heavily on the competitiveness of transport markets.

- There appeared to be unexploited opportunities for providing direct economic benefits to the poor through labour-based road construction and maintenance.

Studies of the impact of alternative approaches to the provision of Water and Sanitation services in the region have stressed the importance of community involvement, local government capacity building, cost recovery and effective targeting of the poor as elements of a sustainable approach, while noting also that models that work in one context cannot easily be replicated elsewhere.

---

37 A similar conclusion was found in the ADB study of poverty impact of transport and energy for households with a high proportion of elderly, dependents or infirm. ADB (2003a. p.25) also notes that there is evidence in both Africa and Asia of a “consistent patterns of cultural constraints on women’s transport activities, reinforcing unequal relationships between men and women. These constraints tend to exclude women from the benefits of transport investments, either by limiting their participation or by limiting their ability to retain any benefits they may receive. However, the study [Fernando and Porter, 2002] also finds evidence of cultural change in the face of changing economic realities. In fact, poorer women may be more readily “liberated” from these constraints than more well-to-do women.”

C. Studies of the Impact of the Policy and Institutional Framework

The studies reviewed above have focused on measuring the impact of investments (and in some cases related infrastructure services) on indicators relevant to growth and poverty. The third category of study focuses not on the impact of investment or service provision, but on changes in the policy, regulatory and institutional framework, particularly those changes associated with an increased role for the private sector and pricing reforms.

An example where institutional reform may be especially important relates to roads sector management. Despite the successes in terms of demonstrable impact from road investment and maintenance, a review of roads policy in the largest ADB DMCs\(^{39}\) found that none of the countries was spending adequately on routine and preventative maintenance, and only in a few (including Indonesia and Thailand) were there signs of a strengthening of road management systems.

This literature has begun with the critique of the standard international model for infrastructure service provision - public monopoly provision of infrastructure services (water and sanitation, electricity, port services, telecommunications, railways) operating under policy frameworks that sought to provide universal access to services, generally at prices that were subsidised and often differentiated between users. Gaps in the market for services were filled by small-scale providers of competing services (sometimes operating illegally) who used alternative, less-infrastructure dependent technologies. The critique of this model (e.g WDR 2004 Chapter 9; Irwin and Brook, 2003) has been that:

- Subsidies tended not to be effectively targeted on the poor who suffered from lack of access to services while users received subsidies.
- Heavy state involvement and a failure to separate ownership, regulation and provision facilitated both the politicisation of decision-making and corruption.
- Monopolies and protected market positions combined with soft budget constraints encouraged inefficiency.
- Inefficiency and pricing policies that did not require cost recovery led to persistent underfunding, restricting investment and leading to the neglect of maintenance expenditures.
- Poor people lacking effective voice or purchasing power were the primary victims of these policies.

Clarke and Wallsten (2003) examine evidence from internationally comparable household survey data of developing and transition\(^{40}\) to assess the impact on access to infrastructure service for the poor of strategies based on universal access funded by cross-subsidies. They conclude that cross-subsidies have often been poorly targeted and have typically failed to reach poor consumers, while apart from in Eastern Europe, state-owned monopolies were ineffective in reaching poor or rural consumers. World Bank (2004b) argues that cross-subsidy policies in Indonesia are inefficient and

\(^{39}\) Harral (2001).

\(^{40}\) The applicability of their conclusions are limited however by the fact that no countries within the East Asia and Pacific Region are included – the bulk being in Africa and Latin America, and the remainder in Eastern Europe and Central Asia.
poorly targeted on the poor – however in general there appears to be a lack of quantitative studies of the impact of subsidy policies within the region.

In relation to water and sanitation, the traditional model in developing countries has been to respond to the market failures through public ownership and subsidised tariffs to reflect the public health benefits. A common situation is that the public operating bodies run at huge losses (often failing even to meet O&M costs), are inefficient, and fail to meet demand (especially for new connections). The poorer sections of the community miss out because they have no access to the subsidised public systems, and are required to spend large proportions of their income on other sources and/or large amounts of time collecting water from sources that are typically a long distance away and polluted. In response to these problems, the private sector is increasingly being introduced in various ways to improve efficiency and to expand piped water supplies (and sewerage). This is a politically charged sector resulting in protests and mixed results. But there are also successes, and well-designed public/private schemes can bring large benefits. Tariffs are a key issue in any private sector scheme, for which the revenue stream is relevant.

DFID (2002) presents a useful summary of weaknesses in major transport, energy, irrigation and telecommunications infrastructure projects based on evaluations by donors supporting such investments:

- Lack of a clear and accountable process of prioritisation too often facilitated corrupt practices, including looting of public funds and the selection of sub-optimal projects for political or personal gain that undermined their contribution to growth.
- Lack of attention to the management and financing of maintenance led to severe deterioration of the infrastructure.
- Environmental effects were often inadequately planned for or monitored. These include land use changes, deforestation, loss of biodiversity, migration to and from project areas and disruption of indigenous populations.
- Institutional strengthening and capacity-building in both the public and private sectors received insufficient attention, including the promotion of appropriate regulatory frameworks and public accountability, establishment of a secure flow of funds for maintenance, and development of commercially-oriented business practices.
- The effects on poverty, gender issues and livelihoods were seldom addressed in any detail, either in planning or evaluation. Too many large-scale infrastructure projects had unanticipated negative consequences for the poor.

These critiques suggest that if successfully implemented, reforms that increase competition, and improve accountability should benefit the poor who are argued to be the main losers from the standard model. However, there is little ex post information available on reform experience on which to make an assessment in practice, and it is evident (for example from problems encountered in some countries such as India in electricity reform) that issues of regulatory design and implementation may present an obstacle to achieving the potential benefits of reform. Willoughby (2003) suggests that despite major changes in thinking within aid agencies about infrastructure policy and the role of infrastructure agencies, there has been little progress in bringing about changes in attitudes and increases in skills within infrastructure agencies in most developing countries.
Irwin and Brook (2003) state that:

“While relatively little evidence on the effects of recent reforms on access exists, some of the early research is positive. Much of it comes from telecommunications, where private participation and competition have been associated with strong growth in access. In other sectors, in which reforms have been less widespread and reliable data are harder to find, less systematic data exists.”

In part this reflects the limited progress in, and relatively recent timing of, reform implementation (which within the developing world has been concentrated in Latin America). For example, Choynowski (2004) notes that in general in developing countries in Asia, progress in implementing power sector reform has lagged behind some other parts of the world because:

“Most countries have had to restructure and reform technically and financially less efficient power systems with less developed private sectors, weak economic and political institutions, and shortages of capacity and regulatory experience. Nevertheless, firm plans for restructuring and regulatory reform have been made in some of the larger DMCs – Bangladesh, PRC, Philippines, Thailand and Sri Lanka – with a view to establishing wholesale electricity markets. The speed with which these reforms will be implemented will depend on these DMCs’ ability to overcome systemic obstacles and institutional shortcomings.”

The available literature mainly relates to case studies and impact evaluations in cases where reforms have occurred with donor support. These are suggestive but do not allow strong general conclusions to be drawn. Some examples within the region include the following:

- Innocencio and David (2001) review the impact of the privatisation of Metro Manila’s water and sanitation network in 1997 under concession agreements. This has led to large-scale network expansion and innovative programmes that target low income neighbourhoods, arguing that the example shows the importance of extending flexibility to the concessionaire and of allowing alternative service providers to service markets.

- The Dalian (PRC) water supply project is cited as an example of showing how consumers are prepared to pay increased water tariffs when the benefits of an improved service are demonstrated.


- There has been limited success in attempts to attract private finance into road building, with overoptimism about traffic and the level of tolls that will be acceptable, as well as possibly unrealistic contractual expectations and regulatory arrangements contributing to disappointing results in PRC and Thailand, among other countries (Willoughby, 2002).

41 Willoughby (2002) provides an overview of the main studies of telecommunications reform.

42 The note also case studies on private participation in water and sewerage from Africa and Latin America which provides some evidence of improved access (Shirley and Ménard, 2002).

43 ADB has reviewed cost recovery programmes in electricity, but the evaluation does not examine issues related to the distributional or poverty impact of pricing reforms (ADB, 2003).
Contribution of Infrastructure to Growth and Poverty Reduction

As official development assistance to large-scale infrastructure projects has fallen overall, there has been an increase in resources provided to Social Investment Fund and Community Driven Development activities, which have a significant focus on local village-level infrastructure, notably water supply and sanitation and small road and associated works. Wong and Guggenheim (2003) identify 34 active IBRD/IDA CDD projects in the region with a total loan of about $2 bn, with 46% of the total CDD investment taking place in Indonesia. Initial reviews of this experience focused on water supply (reported in Willoughby, 2002) have concluded that targeting the poor can be difficult and dependent on the capacity to develop community and beneficiary leadership in identifying and supervising supply. Initial comprehensive reviews of Social Investment Funds found they have been highly effective in organizing partnerships for delivering small-scale infrastructure with benefits slanted to some degree towards the poor, but that impact has been limited by lack of integration with relevant sector institutions and the difficulty of spreading the participatory approach.

As noted in Section 2D, the interactions between infrastructure investment and the overall fiscal position are of crucial importance, in terms both of the fiscal implications of public investment for other forms of public spending, and the extent to which the definition of the overall fiscal space available permits public investment in infrastructure. Estache (2004) notes that the aggregate information on which to base an assessment of fiscal trends and public investment is very incomplete. For the one region of the developing world for which reasonably accurate and comprehensive statistics are available, Latin America, the 1990s saw a substantial drop in public investment in infrastructure (estimated to be more than 50%), with public investment in total being disproportionately reduced compared to the overall size of fiscal adjustment that occurred, and public investment in infrastructure being reduced even further and with private sector investment failing to fill the gap as had originally been anticipated.

The evidence available suggests a similar pattern for those East Asian countries that suffered the brunt of the 1997 Crisis. For example, in Indonesia, central government development spending fell from almost $14 billion in 1994 (of which 57% was for infrastructure) to less than $5 billion in 2002 (with only 30% for infrastructure). At the same time private commitments to infrastructure investment fell from a peak of over $6 billion in 1996 to around $0.5 billion in 2002, before recovering to around $2 billion in 2002 (World Bank, 2004b). Medalla (2004) reports that in the Philippines public expenditure on infrastructure investment halved as a proportion of GDP from a peak in 1995 to 2004, when the total was only just over 1% of GDP. Comparisons across the region would tend to suggest that high levels of private infrastructure investment tend to be associated with high levels of public investment, rather than providing a substitute, and that a crisis requiring fiscal adjustment will have a disproportionate impact on both. The tendency of

44 A more negative view of international experience with CDD is presented by Mansuri and Rao (2004). Reviewing experience with community-based and -driven development projects more broadly conclude that “Projects that rely on community participation have not been particularly effective at targeting the poor. There is some evidence that such projects create effective community infrastructure, but not a single study establishes a causal relationship between any outcome and participatory elements of a community-based development project. Most such projects are dominated by elites, and both targeting and project quality tend to be markedly worse in more unequal communities.” Wong and Guggenheim (2003) report on the first phase of an evaluation of IBRD/IDA projects noting the weakness of the monitoring and evaluation systems for most of the projects.

45 This reflects the fact that such investment is relatively discretionary compared to payments for salaries, pensions, and statutory transfers as well as the tendency of standard approaches to fiscal accounting to overly constrain public investment noted in IMF (2004a).
Contribution of Infrastructure to Growth and Poverty Reduction

infrastructure spending to change more than proportionately to the overall fiscal stance is illustrated for a situation of sustained fiscal expansion by China: annual capital expenditures for transport, electricity, piped gas, telecommunications, urban water supply and sanitation in China increased steadily from US$39 billion in 1994, to US$88 billion in 1998, and to US$123 billion (about 8.7% of GDP) in 2003 (Liu, 2004).

Section 2E outlined approaches for understanding how the wider institutional framework might affect the overall quality and quantity of infrastructure investment, and the extent to which the interests of the poor are reflected in both the policy making process and the operation of market mechanisms, given that both are likely to be significant for infrastructure investments and service provision. The interests of the poor will generally suffer to the extent that:

- Infrastructure investment decisions (e.g. location, contract awards) are influenced by concerns of political patronage or rent-seeking by officials and politicians, rather than concerns about efficiency and value for money in terms of development outcomes.
- Private infrastructure investment is discouraged by capricious, unpredictable or predatory behaviour by public authorities.
- Limited purchasing power makes it uneconomic for profit-oriented service providers to extend service networks to poor areas or remote areas where a disproportionate share of the population is likely to be poor.

While there is a significant literature examining the role and forms of corruption within countries in the region and discussing the progress and characteristics of anti-corruption programmes, this does not draw quantitative conclusions about its impact in relation to poverty and infrastructure. World Bank (2004b, p. 76) in discussing forms of corruption that have affected infrastructure in Indonesia notes that “the infrastructure sectors have long been fertile territory for corruption in both developed and developing countries. While public interest tends to be most easily captured by reports of malfeasance in the implementation of mega-projects, opportunities for extracting rents are abundant – and exploited - in most facets of infrastructure provision” and notes that the amount of public funds extracted through corrupt practice in public procurement “may be as high as 30%.”

In the absence of a more comprehensive analysis, several tentative observations can be presented:

- First, as shown in Table 13, there are substantial differences in the quality of governance within the region. However, the general trend is towards a deterioration rather than improvement in governance. Comparing 2002 with 1996, only Cambodia, Mongolia and Fiji saw more of the indicator areas record improvement than decline. Only Thailand among the countries covered in both periods improved the control of corruption.

---

46 One approach to doing this could be to examine the extent to which differences in infrastructure provision between countries in terms of quantity and quality in the model of Calderón and Servén (2004) can be causally explained by governance indicators.

47 This data is from Kaufman et al (2003) and involves combining data and perception surveys from a wide range of sources for each indicator. The data has been normalised so that 0% equals –2.5 (the worst score) as reported in the original dataset and 100% equals 2.5 (the best score). The change since 1996 is the absolute difference between the scores (not the percentage change in the score).
• Second, while high scores in one area of governance tend to be related to high scores in others, the link is not an automatic one. Notably, China scores fourth highest in the region (excluding Singapore) in relation to government effectiveness but third lowest in terms of voice and accountability.

• Third, the relationship between commitment to and capacity to implement national poverty reduction goals and governance is not a straightforward one. For instance, Conway (2004) argues for Vietnam that within the context of a one-party state, state-society relationships have required the state to demonstrate its legitimacy and to negotiate policy with society. While Party-affiliated organizations do serve as elements of a corporatist state, they also provide channels for communication to political leaders. He contends that a consensus-based policy-making that is slow and opaque to outsiders does ensure a level of broad internal consultation and provides some checks and balances. The formally very different and more open political system in the Philippines, as described by Medalla (2004), has generally not succeeded in implementing coherent infrastructure policies, with a highly competitive and unstable political environment (leading the Philippines to score lower than Vietnam in relation to political stability and rule of law indicators, and roughly equivalently in terms of corruption control) leading to a domination of legislative decision-making by short-term and patronage considerations.
Table 13: Governance Indicators – 2002 and change from 1996

<table>
<thead>
<tr>
<th>Country</th>
<th>Voice and Accountability</th>
<th>Political Stability</th>
<th>Government Effectiveness</th>
<th>Regulator Quality</th>
<th>Rule of Law</th>
<th>Control of Corruption</th>
<th>Voice and Accountability</th>
<th>Political Stability</th>
<th>Government Effectiveness</th>
<th>Regulator Quality</th>
<th>Rule of Law</th>
<th>Control of Corruption</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMBODIA</td>
<td>38.8%</td>
<td>55.0%</td>
<td>38.8%</td>
<td>41.4%</td>
<td>32.8%</td>
<td>31.9%</td>
<td>1.8%</td>
<td>27.0%</td>
<td>2.6%</td>
<td>-2.5%</td>
<td>0.1%</td>
<td>-0.6%</td>
</tr>
<tr>
<td>CHINA</td>
<td>22.3%</td>
<td>54.4%</td>
<td>53.7%</td>
<td>41.8%</td>
<td>45.6%</td>
<td>41.9%</td>
<td>-3.3%</td>
<td>-0.3%</td>
<td>1.5%</td>
<td>-6.2%</td>
<td>4.1%</td>
<td>-7.9%</td>
</tr>
<tr>
<td>INDONESIA</td>
<td>40.2%</td>
<td>22.6%</td>
<td>38.8%</td>
<td>36.4%</td>
<td>34.0%</td>
<td>26.8%</td>
<td>11.9%</td>
<td>-20.6%</td>
<td>-12.7%</td>
<td>-17.4%</td>
<td>-9.3%</td>
<td>-14.4%</td>
</tr>
<tr>
<td>LAOS</td>
<td>15.3%</td>
<td>47.6%</td>
<td>34.1%</td>
<td>25.2%</td>
<td>29.0%</td>
<td>25.0%</td>
<td>-13.9%</td>
<td>-21.6%</td>
<td>-13.4%</td>
<td>-3.3%</td>
<td>4.8%</td>
<td>-7.6%</td>
</tr>
<tr>
<td>MALAYSIA</td>
<td>44.5%</td>
<td>60.2%</td>
<td>68.5%</td>
<td>61.5%</td>
<td>61.5%</td>
<td>57.5%</td>
<td>-4.6%</td>
<td>-8.3%</td>
<td>2.4%</td>
<td>-2.4%</td>
<td>-4.5%</td>
<td>-2.1%</td>
</tr>
<tr>
<td>MONGOLIA</td>
<td>58.8%</td>
<td>69.0%</td>
<td>46.4%</td>
<td>46.4%</td>
<td>57.2%</td>
<td>47.2%</td>
<td>1.6%</td>
<td>5.4%</td>
<td>1.7%</td>
<td>7.4%</td>
<td>-1.8%</td>
<td>-9.6%</td>
</tr>
<tr>
<td>MYANMAR</td>
<td>9.1%</td>
<td>22.4%</td>
<td>24.3%</td>
<td>12.9%</td>
<td>17.6%</td>
<td>22.6%</td>
<td>-8.0%</td>
<td>-9.1%</td>
<td>-7.5%</td>
<td>-16.5%</td>
<td>-7.4%</td>
<td>-5.6%</td>
</tr>
<tr>
<td>PAPUA NEW GUINEA</td>
<td>47.0%</td>
<td>34.8%</td>
<td>34.3%</td>
<td>41.2%</td>
<td>33.7%</td>
<td>32.0%</td>
<td>-6.3%</td>
<td>9.6%</td>
<td>-8.2%</td>
<td>5.8%</td>
<td>-10.0%</td>
<td>-13.0%</td>
</tr>
<tr>
<td>PHILIPPINES</td>
<td>53.3%</td>
<td>40.2%</td>
<td>48.7%</td>
<td>51.9%</td>
<td>40.0%</td>
<td>39.5%</td>
<td>0.0%</td>
<td>-8.8%</td>
<td>-3.2%</td>
<td>-4.9%</td>
<td>-7.8%</td>
<td>-3.1%</td>
</tr>
<tr>
<td>THAILAND</td>
<td>53.9%</td>
<td>61.0%</td>
<td>55.6%</td>
<td>56.8%</td>
<td>56.0%</td>
<td>46.9%</td>
<td>3.7%</td>
<td>6.7%</td>
<td>-0.7%</td>
<td>-0.7%</td>
<td>-3.3%</td>
<td>2.9%</td>
</tr>
<tr>
<td>VIETNAM</td>
<td>22.9%</td>
<td>59.8%</td>
<td>44.7%</td>
<td>36.2%</td>
<td>42.1%</td>
<td>36.4%</td>
<td>-2.3%</td>
<td>2.3%</td>
<td>-1.7%</td>
<td>-2.9%</td>
<td>1.6%</td>
<td>-1.6%</td>
</tr>
<tr>
<td>FIJI</td>
<td>48.8%</td>
<td>53.6%</td>
<td>51.2%</td>
<td>48.0%</td>
<td>42.2%</td>
<td>52.5%</td>
<td>0.4%</td>
<td>-7.4%</td>
<td>3.7%</td>
<td>8.0%</td>
<td>-9.6%</td>
<td>..</td>
</tr>
<tr>
<td>MICRONESIA</td>
<td>68.7%</td>
<td>..</td>
<td>44.2%</td>
<td>36.1%</td>
<td>37.1%</td>
<td>41.1%</td>
<td>-3.9%</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>KIRIBATI</td>
<td>71.9%</td>
<td>..</td>
<td>51.2%</td>
<td>27.7%</td>
<td>43.6%</td>
<td>41.1%</td>
<td>-0.5%</td>
<td>..</td>
<td>7.5%</td>
<td>-15.0%</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>MARSHALL ISLANDS</td>
<td>74.5%</td>
<td>..</td>
<td>41.8%</td>
<td>38.9%</td>
<td>43.6%</td>
<td>49.6%</td>
<td>1.1%</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>SAMOA</td>
<td>63.4%</td>
<td>66.2%</td>
<td>54.6%</td>
<td>48.7%</td>
<td>68.8%</td>
<td>48.9%</td>
<td>-1.4%</td>
<td>..</td>
<td>10.9%</td>
<td>3.4%</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>SOLOMON ISLANDS</td>
<td>57.4%</td>
<td>..</td>
<td>23.1%</td>
<td>24.9%</td>
<td>37.1%</td>
<td>32.7%</td>
<td>-13.1%</td>
<td>..</td>
<td>-8.1%</td>
<td>-2.4%</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>TONGA</td>
<td>47.6%</td>
<td>..</td>
<td>37.2%</td>
<td>33.3%</td>
<td>37.1%</td>
<td>41.1%</td>
<td>-2.4%</td>
<td>..</td>
<td>-9.1%</td>
<td>-13.3%</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VANUATU</td>
<td>67.7%</td>
<td>..</td>
<td>37.2%</td>
<td>33.3%</td>
<td>43.6%</td>
<td>41.1%</td>
<td>8.6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SINGAPORE</td>
<td>60.2%</td>
<td>75.6%</td>
<td>95.2%</td>
<td>87.9%</td>
<td>85.0%</td>
<td>96.1%</td>
<td>..</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contribution of Infrastructure to Growth and Poverty Reduction
5. Policy Implications

The key conclusions of this review can be summarised as follows:

- Achieving rapid economic growth requires investment in infrastructure, and higher levels of infrastructure investment (especially where these focus on broadening access to opportunities and integrating remote areas with national and international markets) are also likely to be associated with a relatively more pro-poor pattern of growth – a well-tailored infrastructure investment strategy may be able both to achieve growth and to at least temper the trend towards increasing inequality. As noted in section 2, the trend in most of the economies of the region has been towards growth with growing inequality – a pattern which contrasts with that of earlier phases of growth in the region. Mody (1997, pp xi-xii) argues that infrastructure investment was a key feature of this pattern of growth:

“This sustained commitment to high quality infrastructure was the product of a long-range vision: to maintain the region’s competitiveness in export markets, to attract foreign investment in the region, and to support more balanced social development. Compared with an average infrastructure investment of 4 percent of GDP and was often higher, reaching 7 or 8 percent in several years.”

- While some countries in the region (notably China) are succeeding in sustaining exceptionally high levels of public investment and also attracting increasing private investment in infrastructure, in others fiscal stress and a lack of confidence from potential private investors means that the gap between infrastructure needs for growth and poverty reduction and current investment levels is very high.

- Poverty within the region remains overwhelmingly rural and concentrated in areas that are poorly connected to national centres of growth and to export markets (particularly to deepwater ports). Most of the countries in the region are enjoying strong rates of economic growth and poverty reduction by international standards and have continued to achieve improvements in infrastructure access, though a significant minority (Myanmar, PNG, the smaller Pacific islands) are making at best only limited progress. This growth is reducing poverty but in the context of increasing inequality, with a significant part of this inequality related to geographical location. Integration of lagging areas into the national, regional and international economy will be critical for equalising the benefits of growth. Infrastructure investment is of central (though not sole) importance for achieving this. The impact on employment opportunities for the poor will be decisive in determining overall poverty impact.

- At the same time, rapid urbanisation is continuing and this is putting additional strain on urban infrastructure, as well as leading to dense settlement in peri-urban areas that are often very poorly equipped in terms of infrastructure. The rapid pace of urbanisation, and the fact that infrastructure provision in both rural and urban areas is likely to impact on this rate, means that national infrastructure strategies have to address both rural and urban infrastructure provision and the interaction between the two.

- There are strong a priori reasons and empirical evidence to suggest that across much of the region rural roads and improved water and sanitation services are the forms of infrastructure investment that will have the greatest positive direct impact on the poor. These are sectors where performance appears to have lagged other more dynamic sectors, and where cost
Contribution of Infrastructure to Growth and Poverty Reduction

recovery and attracting private investment have proved particularly problematic, although there are positive examples.

- There has to date been relatively limited progress within the region in effective policy and institutional reform in the sectors where infrastructure is important, particularly outside the telecommunications sector where the rapid pace of technological change has driven reform. The regulatory and wider institutional framework for private sector participation remains generally weak and there is evidence that the governance environment (affecting the quality of public investment as well as the incentives for private investment) across the region is tending to deteriorate rather than to improve.

- Pricing policies for infrastructure services often involve subsidies but these appear to be poorly targeted on the poor particularly to the extent that the size of subsidy received is generally proportional to the use of the service, rather than being focused on widening access to those who are currently not served. The political acceptability of cost recovery-based pricing is especially important in determining the policy options that are available given the competing priorities for public funding.

- The extent to which the interests or voices of the poor are reflected in decision-making about infrastructure (whether at national or local level) is important for determining impact. Community participation plays an important role in ensuring effective and sustainable provision of infrastructure services at the local level, but reaching the poor still poses major challenges.

These considerations suggest that the following can be regarded as the key elements of a pro-poor infrastructure policy for the region:

- Improved growth (as well as more pro-poor patterns of growth) requires higher levels of infrastructure investment in most countries in the region. In a few, notably China, the problem is one of managing the risk of overheating and overinvestment, while also seeking to raise the quality of investment and direct it towards priorities for poverty reduction. While there are substantial opportunities for increasing private investment, public investment in aggregate is likely to be a complement to this rather than a substitute for it.

- The prospects for both effective public investment and for attracting private investment depend on improving key aspects of governance and the policy environment, as well as creating fiscal space for investment-oriented public expenditure. Fiscal space can be increased though improving cost recovery especially in sectors where this has been limited in the past, improving efficiency in public procurement and management, reorienting public expenditure from current to capital, encouraging private investment in sectors where this is most feasible, and potentially from reconsidering fiscal rules to the extent that these may be excessively biased against long-term investment.

- A planning perspective is required that is explicitly cross-sectoral and informed by an analysis of the nature of poverty at national and sub-national level and an understanding of the ways (both direct and indirect) in which infrastructure investment and service provision is likely to impact on the poor, including through its impact on the rural-urban migration dynamic. The strategy needs to consider the operation of markets for infrastructure services as well as the investments themselves. Such a strategy is likely to lead to infrastructure investment needs to be placed at the heart of public expenditure priorities as expressed in poverty reduction strategies. In general, investment (in maintenance as well as new capital)
in rural roads, water and sanitation and in transport and communications infrastructure will be central for a strategy for improving the integration of lagging areas into the national and international economy.

- Achieving effective participation in decision-making by, and improved targeting on, the poor are central to a pro-poor infrastructure strategy. However, experience suggests that this can involve major challenges and caution should be used in applying received models in different contexts. There is however a body of useful experience within the region to provide guidance, particularly in the context of wider moves towards decentralisation and building of the capacity of lower tiers of government.
Contribution of Infrastructure to Growth and Poverty Reduction

Bibliography/List of References


ADBI (2003), Infrastructure Investment for Poverty Reduction: What Do We Know?, 12-13 June, Tokyo.


Cook, C.C., (2003), The Role of Infrastructure and Infrastructure Services in Poverty Reduction, Background Paper for the ADB Poverty Reduction Strategy Review.


Foley, S., A. Soedjanwo, and R. Pollard (2000), Of the People, By the People, For the People: Community-Based Sewer Systems in Malang, Indonesia, Water and Sanitation Program, Field Note, March.


Contribution of Infrastructure to Growth and Poverty Reduction


Liu, Z., (2004), Planning and Policy Coordination in China’s Infrastructure Development, Background Paper for the EAP Infrastructure Flagship Study.


Medalla, F.M. (2004), Planning, Budgeting, Policy Coordination and Infrastructure Development in the Philippines, Presentation at the Bali Workshop.


OPM (2003), Poverty and Growth in Asia, Paper for DFID.


Contribution of Infrastructure to Growth and Poverty Reduction


UNESRAP (2003b) “Promoting the Millennium Development Goals in Asia and the Pacific: Meeting the Challenges of Poverty Reduction”, United Nations Economic and Social Research for Asia and the Pacific


Oxford Policy Management, October 2004 65


