

Infrastructure and Pro-Poor Growth: Implications of Recent Research

Summary

The poor in developing countries have traditionally shared to a small extent in the effects of improved infrastructure on consumer prices, employment, public services and travel, but they have been largely excluded from direct service.

Early research on economic growth illustrated the importance of infrastructure's contribution, provided that a good balance was maintained with other investments and that the infrastructure and related services were run efficiently. More recent econometric research suggests that infrastructure investment and improvement are especially important, and may often have received too little attention, in the lowest-income countries. There are also signs that infrastructure has been underinvested in some fast-growing middle-income countries; this has led, in some cases, to geographic patterns of development which hamper economic growth.

Comparative analyses of the growth performance of the regions of some major countries have shown that sustained investment in the various dimensions of economic infrastructure has been critical – not only to overall growth but also to reduction of poverty, particularly through their impact on growth of non-farm rural employment. Lagging infrastructure sectors appear to have been quicker to catch up and re-establish balance than lagging regions. In several cases studied, the latter seem potentially to offer scope for investment in infrastructure that would yield higher economic returns (as well as doing more for poverty reduction) than further infrastructure investment in more advanced areas.

The degree of efficiency in the organization of infrastructure investment, in its maintenance and in the provision of services from it (TFP within the sector, broadly defined) has had major effect on outcomes. This points to large potential gain from institutional reforms that strengthen the capacities of local and regional government for managing the framework for infrastructure and the capacities of infrastructure organizations to provide customer-responsive services.

The large-scale arrival of the private sector on the infrastructure scene in the 1990s has contributed to bringing about these improvements, but mostly in countries which were already making faster progress. However, the private sector, international as well as national, has also demonstrated readiness to take on the problems of the lagging countries and regions. Governments face a major challenge to enable this to take place, at the same time as reforming the services which, albeit with the aid of subcontracting, they alone can provide.

To bring about growth that is pro-poor in more countries, and hence to ensure a truly pro-poor pattern to world development, the infrastructure reform process has to spread widely. The research reviewed and experience to date indicate several measures that need more emphasis in the course of promoting this spread:

- Due to the impact it can have on efficiency of use of infrastructure assets and on easing investment constraints, continued rapid spread of institutional reform is the most important measure to improve infrastructure's contribution to pro-poor growth.
- Effective competition in service provision will be the key factor in securing wider and better infrastructure service to the poor, so regulatory emphasis needs to shift from supervision of monopolies to assuring competition.
- Local government capacities for managing municipal development and finances, with attention to the needs of the poor and unprotected, need further strengthening, in addition to those of poor communities themselves which have recently had more emphasis in the context of efforts to promote beneficiary participation.
- Infrastructure improvements have an indispensable contribution to make to attainment of Millennium Development Goals in Education and Health, and attention should be given as much to social as to economic initiatives when seeking to identify key accompanying measures to help secure best results from an infrastructure investment.
- Scale and content of programmes to improve infrastructure services to the poor should be strongly guided by economic analyses focussing on the impact that the services could have on the local economy – costs and prices, production and employment volumes, education participation, health improvements, etc. – and aiming at project rates of return comparable with those earned on other public investments.
- More rapid progress must be made in reducing the very large subsidies – both financial and economic (externalities) – conveyed through infrastructure to the non-poor.
- Donor agencies have to collaborate more effectively to help countries overcome the special problem of corruption-ridden public infrastructure agencies closely integrated into national political structures.
- Subsidies effectively targeted to the poor – for instance, for help with vital transport services or with the high costs of a utility connection – can sometimes play a useful role, but much caution is required regarding their equity, and effectiveness in actually increasing assets of the poor, when the numbers reached are small compared to those to be raised out of poverty..
- Groups facing major changes from reform, especially those not far from poverty as well as those politically influential, should be brought fully into consultation at the planning stage and sensitively assisted with adaptation.
- The international community should give particular attention to improvement of infrastructure services essential to the landlocked countries, and to the populous landlocked regions of major poor countries such as India, China and Pakistan.

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I. Introduction

Experimentation and reform...

1. The 1990s saw much experimentation in the developing countries with new ways to organize the delivery of infrastructure services, and the momentum toward reform is spreading. It has been motivated mainly by concern for increased efficiency, in a world of increasing competitiveness among nations, cities and firms, and to a lesser extent by the search for greater equity. The purpose of this paper is to review research of the last ten years on the role of infrastructure in development, and more briefly recent reform experience, with a view to identifying the issues in need of further attention in the infrastructure sectors if the world is to reach the Millennium Development Goals – especially that of halving, by 2015, the proportion of people who were living in 1990 on less than one dollar per day (measured in 1993 PPP prices). This target would require lifting out of extreme poverty over these 25 years about one billion people, principally in South Asia, sub-Saharan Africa and East Asia; the aim is for progress in all countries and regions (DFID, 2000).

2. Infrastructure is taken here to cover all the main common-user services – energy and water supply, transport and telecommunications, sanitation and waste facilities, flood protection and drainage, and other general-purpose urban facilities. Irrigation is also touched on. The coverage corresponds to what is sometimes called ‘economic infrastructure’, by contrast with ‘social infrastructure’ which would include facilities such as schools, hospitals and cultural centres. Economic infrastructure provides services to a wide range of users and also structures the environment in which people live and work, both limiting and expanding choices. Most infrastructure systems consist of both trunk/bulk-supply installations and local distribution/collection networks. Both are relevant to the poor, the latter to their direct inclusion in the service, and the former for the price and reliability with which they can be served and because of the dependence of economic growth, trade and employment on the adequacy of the installations and the efficiency with which they are run.

But the poor remain largely excluded from access to basic infrastructure

3. Still today, however, direct inclusion in the service is more a matter of hope than reality for the vast majority of the poor. “The lack of basic infrastructure – particularly roads, transportation and water – is seen as a defining characteristic of poverty,” as it was put in summarizing the views expressed by poor people in a recent worldwide canvass of their opinions (Narayan, 2000). To meet essential needs, those unserved by utilities are typically paying much more, per unit, than those served – some 50 times as much per kwh for lighting by candles, kerosene and batteries according to a recent study in Guatemala and 5-16 times as much per cubic meter for water from private vendors in Port-au-Prince, Haiti (World Bank, 2001c). The latter figures are consistent with, though on the low side of, those reported for a range of cities throughout the developing

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world (Bathia and Falkenmark, 1993). Alternatives to utility services involve high time costs for collection of water and fuel, and frequently health costs from smoke and poor water quality. As regards transport, a recent survey of pavement dwellers in Bombay showed that the main reason for living in such insecure dwellings was to be able to walk to work (quoted in Willoughby, 2000b). City studies suggest that increasing numbers of the poor are having in fact to spend 25% or more of income (and much time) on the journey to work (World Bank, 2001b; Willoughby, 2000b; and sources quoted in Booth, Hanmer and Lovell, 2000). The conditions described with regard to the various infrastructure services pose notably heavy burdens on women, particularly in Africa, and constitute serious obstacles to use of public health and educational facilities and participation in social activities, especially in rural areas but increasingly in urban areas as they expand.

4. To help make growth in the coming years more effectively pro-poor clearly presents the infrastructure sectors with major challenges. A recent review of needs based on Living Standards Measurement Studies for 15 countries highlights in particular the needs in the water and sanitation sector (Komives, Whittington and Wu, 2001). Urban transport also presents a large backlog, with relatively limited past involvement of foreign investment (whether private or public), and huge additional needs connected with the rapid pace of urbanization underway and expected to continue (World Bank, 2001b). Improved road maintenance remains a priority need, especially in Africa, and better response to the needs of the poor requires redoubled country effort on rural road improvement. The number of people without home electricity supply is still considered to be in the neighbourhood of two billion, nearly one-third of world population, and principally in rural areas of the developing countries.

5. The research reviewed for purposes of this report is primarily that on economic growth and the role of infrastructure in supporting it, more detailed work that has been done on rural development and poverty reduction, especially in India and China, some applications of the “new economic geography” to the developing countries and, more selectively, assessments of the infrastructure reform experience to date. Section II below deals with growth research, Section III (sub-national) regional analyses, Section IV economic geography, Section V infrastructure reform, and Section VI issues for increased attention.

II. Links Between Infrastructure Investment and Growth Research

6. Infrastructure in developing countries has received considerable attention from researchers interested in tracing the sources of economic growth, identifying possible externalities to infrastructure investment, or identifying appropriate volumes for public investment. The World Bank’s 1994 World Development Report on “Infrastructure for Development” quoted with some scepticism the often high estimates of infrastructure’s impact that had emerged by that time – much of it from industrialized countries. While econometric techniques have since advanced, work continues to suffer from serious data deficiencies and the difficulties of finding indicators that realistically summarize a field as diverse as infrastructure services.

Infrastructure investment is closely linked to growth...

7. Nonetheless few would dispute that among the more robust findings from growth research is a significant impact of infrastructure investment, as also of human resource development, on growth (Temple, 1999). Both are subject to diminishing returns and have impact in combination with other factors. A large cross-section study of both developing and industrialized countries used individual country studies to obtain more comprehensive information than usually available on public investments in transport and communications, and identified high impact on GDP growth: elasticity of 0.16 (Easterly and Rebelo, 1993). Apparent lack of systematic relationship between volumes of sectoral investment and of general private investments led the authors to conclude that the impact came more through raising the social return to private investment than through spurring new investments.
8. Quantitatively similar results emerged from an even more disaggregated analysis, again based on specially compiled investment series, for Brazil 1950-95, with the transport and energy sectors emerging as most important and telecommunications as of lesser significance (Ferreira and Malliagros, 1998). An attempt to cover public investment in infrastructure more generally in 21 developing countries 1965-84 fell afoul of the need to rely on information sources essentially limited to Central Government expenditures and yielded large variations between different regions of the world to which it was hard to attach any significance (Baffes and Shah, 1998). In Mexico, public infrastructure investment in electricity and communications was found generally to reduce industrial production costs while that in transport tended to raise them, possibly reflecting traditional government use of the sector as an employer of last resort (Feltenstein and Ha, 1995).
9. A recent re-run of Easterly and Rebelo's data for some 100 countries (mainly for the 1970s and 1980s) against alternative models suggested firmer conclusions about the positive impact of overall public investment as well as that in infrastructure (Miller and Tsoukis, 2001). Study of 28 developing countries from 1981 to 1991, using more recent data sets, also found a positive effect of public capital accumulation on long-term growth, with rate of return averaging 14.2%, only marginally below the average return on private capital (Dessus and Herrera, 2000). Thorough analysis of a large 1973-92 data-set for Indian manufacturing led to the conclusion that public investment in electricity generation and major roads yielded substantial positive external economies, rising over time and accounting for nearly one half of the Total Factor Productivity (TFP) residual in the growth equation (Hulten, Bennathan and Srinivasan, 2001).
10. To relate results more directly to investment decision-making, a large data-set on growth of physical stocks of electricity generating capacity and lengths of paved roads in some 100 countries from 1960 to 1990 has been combined with estimation of an aggregate translog production function (Canning and Bennathan, 2000). This, together with estimates of country-specific capital costs for generating capacity and roads, permits comparison of returns (in terms of production contribution) to increments to these two facilities in this period compared with the returns to general capital investment in each country. The results show a bunching of all three rates of return for the industrialized countries, with the infrastructure returns often slightly below returns to general capital, but a much wider dispersion for developing countries, significant numbers showing returns to incremental infrastructure much above those earned on

general capital. No doubt reflecting the difficulties of keeping infrastructure expansion in line with rapid overall economic growth, several middle-income countries show particularly large differentials in rates of return – in addition to generally higher rates of return for all investments than those in other countries. Most of the lowest-income countries also show substantial, though lower, differentials for generating capacity, implying underinvestment, but adequate data were unfortunately not available to show where they would have stood in respect of roads.

11. Other recent research using non-linear functions or treating their data in subsets also raise interesting hypotheses regarding low-income areas. Application of three alternative measures of the impact of public infrastructure investment on the manufacturing sector in Italy (1970-94) showed no consistent results at the national level but a much clearer pattern when the regions were separated (La Ferrara and Marcellino, 2000). The poor south (with little TFP growth) showed a significant and rising impact from public investment, contrasting with much less clear impact in the wealthy north. Cross-country study of 40 developing countries 1965-80 (Dellas and Koubi, 2001) indicated that growth of the industrial labour force (combined with a strong overall investment rate) was a much more important factor in the growth of the poorer ones than equipment investment, the factor highlighted in a well-known article by De Long and Summers (1991). An important implication was that non-equipment investment, including labour-intensive build-up of basic infrastructure, would be a key means of developing and preparing the labour force for the stage when increasing equipment investment would become a main force for growth.

12. An attempt at a model specifying the nature of the link between infrastructure and overall growth stresses the specialization of production which infrastructure makes possible and allows for the diversion of funds from other investment purposes for its creation (Bougheas, Demetriades and Mamuneas, 2000). Model runs on developing-country data found an inverted U-shaped relation between the infrastructure stock (transport and telecommunications) and the rate of economic growth, implying potentially high priority for infrastructure expansion in the poorer countries, bunched on the rising part of the curve.

But quality (efficiency) as well as quantity matters

13. The relationships between infrastructure and economic growth that have been uncovered by empirical growth analyses might well have been stronger had it been possible to represent infrastructure with indicators of the quality and quantity of services actually provided, as opposed to physical stocks and aggregate investment flows. Some indication of the significance of the problem is given by incorporation into a growth model of classifications of countries on the basis of summary indicators (eg., locomotive availability, power system losses) given for a few of the more centralized services in the 1994 World Development Report (Hulten, 1996). It was found that as much as 40% of the more than five percentage-point difference in annual GDP growth rates between the top and bottom quartiles of the 46 countries covered could be explained by such classification, while admitting that this effectiveness classification was probably in fact capturing phenomena beyond mere quality of public infrastructure. But the slow progress in developing more meaningful indicators (compared, for example, with the human resource sectors) reflects practical as well as conceptual problems.

14. A wide-ranging review of African growth experience (Collier and Gunning, 1999) points out that growth analyses for African countries have generally found positive, if weak, impact of infrastructure investment on growth (see also Udegbumam, 2000). It goes on to cite numerous examples of the obstacles to other sectors' productivity posed by poor quality of actual services, and points to real improvement in infrastructure services as one of the most difficult but important tasks for the future.

15. An interesting further attempt to exploit the WDR data on quality and efficiency of infrastructure underlines the significance of these dimensions – and of the manner in which investment is financed – to the ultimate impact of infrastructure investment on GDP growth (Aschauer, 1998). The service-quality and efficiency indicators from the WDR are combined into an aggregate performance index for each country (forming a continuous variable in lieu of the discrete classifications used by Hulten). This index is then applied with other standard indicators of growth of physical and human capital stocks and of foreign debt in a classical growth model, using cross-section data for 46 developing countries for the period 1970-90. The performance index and the foreign debt stock indicator both prove to have high statistical significance in the model, and their addition significantly modifies the coefficients on the other variables.

16. Illustrating the results of the model by its implications for the specific case of Mexico (which ranked already comparatively high on the performance index), Aschauer shows how almost identical growth impact (elasticity of about 0.27) would result from 1% increases in infrastructure efficiency and in infrastructure capital stock, with the effects of the latter in fact turning negative if it were financed entirely by additional foreign debt. Thus it was important to limit additional debt financing and to ensure it was accompanied by substantial non-debt-financed infrastructure investment as well as by further efficiency improvements.

And externalities are significant too...

17. In addition to weaknesses in capturing the reality of infrastructure service, it should not be forgotten that the aggregate growth analyses also suffer from the continued unavailability of GDP figures adjusted for environmental damages and consumption of non-renewable resources (Thomas et al., 2000). The interaction between environment and infrastructure is intensive but complex, both negative and positive. Incorporation of this dimension might well lead to some increase in the estimated growth impact of infrastructure investment at low income levels when infrastructure services are replacing excessive dependence on local natural resources and reducing pollution, and decrease the estimate of its impact at higher income levels when a larger portion of incremental use is for urban car transport with significant negative externalities (Willoughby, 2000b).

18. As regards poverty reduction, as opposed to general economic growth, recent more detailed work on countries' strongly contrasting experience in reducing poverty rates (eg. Ravallion, 2001, benefitting from the comparable data for different recent years that is now beginning to be available for an increasing number of countries due to World Bank-promoted Living Standards Measurement Studies) has unfortunately not yet been extended to include identification of possible correlations with differences in infrastructure variables.

III. Infrastructure and Regional Differentials

19. Studies of the contrasting growth experiences and prospects of different regions within a country usually address the link between infrastructure and poverty reduction in a more focussed manner than the country and cross-country growth research discussed above. Some of these studies are concerned mainly with the issue of potential convergence among the regions' income levels. Others focus directly on poverty reduction, comparing different regions' performance, and often dealing with the link between infrastructure and growth of non-farm rural employment.

India and China provide rich sources for analysis of the impact of infrastructure on regional differences

20. Two recent studies deal respectively with the experience of India and China. A wide-ranging analysis of the growth of the Indian states 1970-94 finds that infrastructure development – especially irrigation, electricity and railways – had large impact and that inter-state differences on this score were a major factor in their contrasting growth performance (Nagaraj, Varoudakis and Véganzonès, 1999). It also identifies positive spillover effects of more strongly growing states on their neighbours. To counter the huge and growing inter-state divergences in income-levels, it suggests greater concentration of infrastructure development effort on selected poorer states, with simultaneous efforts specifically to increase impact of their growth and improved management on those of neighbours.

21. Study of China's record 1985-98 (Démurger, 2001) finds insufficient attention by central and provincial governments to infrastructure (especially transport) development to have been a major factor in the lag of many provinces, particularly in the more landlocked western parts of the country, behind national growth rates. The results of the analysis indicate a concave relationship between infrastructure and economic growth and therefore lead to stress on future development of transport, telecommunications and related logistic services within the lagging provinces as well as their links to the east.

22. The International Food Policy Research Institute (IFPRI) has had a research programme focussing specifically on the effectiveness of different types of government expenditure in reducing rural poverty. It has developed a system of simultaneous equations to capture interlinkages better than had been done in the past and has used regional and local data to run the model. The first study (Fan, Hazell and Thorat, 1999) was on India (1970-93), which is estimated to have reduced rural poverty from levels fluctuating between 50 and 65% until the mid-1960s to about 36% in the mid-1990s. The second study (Fan, Zhang and Zhang, 2000) was on China (1978-97), where the official government estimates used in the report indicate reduction in rural poverty headcount from 33% in 1978 to about 6% by 1997 – but still between 20 and 30% in some of the northern and western provinces.

23. Both studies show that infrastructure development was critical to the progress made in reducing rural poverty and identify large differences between different dimensions of infrastructure in their poverty and productivity effects. They summarize their conclusions by indicating the relative impact on growth and on poverty of increases to the different main spending programmes actually undertaken by the government in the

periods covered. The following table makes an approximate conversion of the results (as slightly revised by IFPRI from the original reports, in light of additional data) to show the estimated potential income and poverty reduction effects of an additional £1,000 equivalent spending on any of the lines of activity listed, in India, China overall, and the western provinces of China.

Returns to £1,000 Additional Spending on Alternative Activities

	-----INDIA-----		-----CHINA-----		WESTERN CHINA		
	Agric. - GDP -	Poor reduced	Agric. - GDP -	- Rural -- - GDP -	Poor reduced	- Rural -- - GDP -	Poor reduced
	(£)	(No.)	(£)	(£)	(No.)	(£)	(No.)
Ag. R&D	13,450	2.7	9,590	9,590	8.0	12,690	39.3
Irrigation	1,360	0.3	1,880	1,880	1.6	1,560	4.8
Roads	5,310	4.0	2,120	8,830	3.9	4,290	12.7
Education	1,390	1.3	3,710	8,680	10.4	5,060	34.0
Electricity	260	0.2	540	1,260	2.7	610	7.3
Conserv'n	960	0.7	n.a.	n.a.	n.a.	n.a.	n.a.
Anti-pov.	1,090	0.6	n.a.	n.a.	1.3	n.a.	1.8
Health	840	0.9	n.a.	n.a.	n.a.	n.a.	n.a.
Telecom.	n.a.	n.a.	1,910	6,980	2.6	4,130	10.1

Notes: - Rural GDP (as in right-hand columns), as opposed to Agric. GDP, includes non-agricultural production.

- Conserv'n means Soil and Water Conservation works.

- Anti-pov. stands for Anti-Poverty programmes in India and for Poverty Loans in China.

24. The table shows that the most productive incremental expenditure for poverty reduction in India would have been on roads, though yielding much less in aggregate income terms than equivalent expenditure on agricultural research and development. In Western China, the latter activity would have been the most productive incremental expenditure from both poverty and income viewpoints, whereas for rural China as a whole incremental spending on education would have been preferable from the poverty reduction viewpoint. Among the infrastructure sectors, rural roads still ranked as a high incremental need, from both poverty and income viewpoints, also in China, and telecommunications almost as high. On the other hand, electricity ranked relatively low because of the huge advances that have already been made in both countries on rural electrification.

25. The IFPRI analyses demonstrate that a particularly important factor in the reduction of poverty in both countries was growth of rural non-farm employment and that this in turn was heavily dependent on the availability of infrastructure services. Exploration of the fact that Indian states have differed considerably in respect of the poverty impact of overall income growth, but not that of farm yield increases, led other researchers (Ravallion and Datt, 1999) to develop and test a model showing that the key factor was different effects of growth in non-farm economic activity in the different states, depending in particular on initial poverty levels, literacy and availability of infrastructure.

Other international evidence on infrastructure and rural development

26. Regional research has also generated some thoughtful papers going much further than the “Western China” columns in the above table to suggest a general pattern, at least in some cases, of potentially higher economic returns now to infrastructure expansion in economically lagging areas than in other parts of a country. One such analysis is a by-product of the IFPRI work on India already discussed. It argues that opportunities for expansion of agricultural production may now often be greater in the previously neglected low-potential rainfed areas that account for 35% of total cropped area in India (Fan and Hazell, 1999). It finds generally higher production impact (in addition to greater poverty impact and possibly significant environmental gains) in such areas than in irrigated or high-potential rainfed areas from incremental roads, electrification, private irrigation and HYV seeds. Ongoing work in regard to roads in Vietnam (Deolalikar, 2001) suggests similar conclusions: a measurably larger effect of public road expenditures in the poorer provinces on agricultural productivity and growth of industrial output per capita, and clear evidence that the presence of a road in a community brings about sizeable improvements in secondary school enrolment and use of public health facilities in the poorer provinces but makes only a smaller difference in those better off. Living standard survey results also show that the creation of new roads correlates with much larger increases in overall consumption per capita and in chances of moving out of poverty in poorer provinces than in richer ones.

27. A recent exploration of rural non-farm growth in different parts of the world shows that the chances of its being effectively poverty-reducing can be significantly increased by assuring the availability of both infrastructure and education to the poor and by improving smallholder agriculture (Reardon et al., 2000). Thorough analyses of the results of a recent household survey in Ecuador illustrate concretely the crucial importance of improved roads and telecommunications and availability of electric power (Lanjouw, 1999).

28. Indicative of the potential positive effects from improvements are the findings of a recent study of the influence of household utility connections on the growth of per capita consumption, controlling for other factors (Chong and Hentschel, 1999). Using recent Peruvian data, they found that households with two utility services experienced consumption growth 10% higher than those with none, while households with all four services – electricity, water, sanitation and telephone – experienced growth that was 37% higher. The electricity service was found to have the single greatest impact on welfare for households in rural areas, while the telephone service had the greatest impact in urban areas. In Cameroon it was found that women located in a village on a main road were able to spend more time producing food to sell and made an average income equivalent to \$570, more than twice the \$225 earned by women in an isolated village located one and a half hours from the road (quoted in Booth, Hanmer and Lovell, 2000).

IV. Economic Geography

29. The last ten years have seen rising attention by economic researchers to economic geography, including the development of the “New Economic Geography” which tries

to explain the spatial structure of the economy using models allowing for increasing returns to scale and imperfect competition (Krugman, 1998). The significance of this work to the subject of Pro-Poor Growth arises not only from the almost total neglect of geographical considerations in growth research (as deplored in Gallup, Sachs and Mellinger, 1998) but more particularly from the critical role of infrastructure (especially transport) in the dynamics of relations between places and of the use of terrestrial space.

The role of infrastructure in improving access to trade opportunities

30. The most prominent work specifically on developing countries has concerned their trade relations with other countries. Combined application of models exploiting three independent sets of data on developing countries' international trade flows and shipping costs shows that the elasticity of trade with respect to transport costs is high, at around – 3.0, and that the median landlocked country faces transport costs around 50% higher than the median coastal economy and hence has a trade volume 60% less (Limão and Venables, 2000). This underlines the particular significance of the costs and quality of infrastructure services between the point of origin/destination in the landlocked country and the ocean vessel.

31. Extension of the analysis specifically to sub-Saharan Africa indicates that transport costs for intra-African trade are well over twice what they would be for trade within other main regions of the developing world (controlling for geographical variables and income levels), and that nearly half of this cost premium is due to weaker infrastructure (as measured by countries' road/rail density and telephone main lines per capita).

32. Review of Uganda's trade situation, after considerable trade liberalization, underlines the burden of high transport costs – for exporters, equivalent in aggregate to about two-thirds of value added, again with about half of it being for the overland portion of the journey; and for producers for the domestic market, providing effective protection equivalent to about half of value added (Milner, Morrissey and Rudaheranwa, 2000). Asked to rank constraints facing their firms using 1 as no obstacle and 4 as a major problem, Ugandan manufacturers, in a recent survey, identified the following top four problems: first, power breakdowns (3.5), second, voltage fluctuations (3), third, telecommunication problems (2.7) and fourth, the quality of roads (2.6) (quoted in Booth, Hanmer and Lovell, 2000).

33. A deep review of sub-Saharan Africa's trade experience and prospects identifies poor infrastructure broadly (not only in transport) as one of the main reasons for low manufactured-good exports, even from densely populated countries, but recommends primary emphasis on the continent's considerable potential in primary products – raw or processed – and, by implication, on strengthening of infrastructure to support achievement of these potentials (Wood and Mayer, 2001).

Strategies for improving access to international markets

34. The Ugandan study mentioned also reviews briefly how the high overland shipping costs might be brought down to more reasonable levels. It suggests that the main initial emphasis should be on national and international management measures such as better infrastructure maintenance, improved railway operations, streamlined border-crossing formalities and reduction of gross port inefficiencies. Research specifically on road

freight operations finds African freight rates and costs some two to five times the levels applying in large Asian countries, with little of the difference being traceable to different tax rates or to worse road conditions (Hine, Ebdon and Swan, 1997). Rather, their recommendations detail the scope for improved competition at all levels – among vehicle importers, service stations, truck operators and drivers, freight forwarders, etc. Some progress appears to have been made in recent years in facilitating international truck movements (though disappointing in respect of transit customs regimes) in the Southern and Eastern African countries, and special attention to coordinated transport-mining-manufacturer-government action on the South African- Mozambican Maputo Development Corridor appears to have yielded promising results which may be replicable in some other cases (UNCTAD, 2001).

Methods of appraising transport investment

35. A second branch in applications of the new thinking about economic geography concerns the methods of appraising transport infrastructure investment projects, focussing in particular on the overall scale of benefits and their distribution between the places linked. Developed originally for the UK's Standing Advisory Committee on Trunk Road Assessment (SACTRA, 1999) and propagated more recently at the European level by the European Conference of Ministers of Transport (ECMT, 2001a and 2001b), this research has considerable relevance to developing countries. It offers the prospect of more useful guidance than can be expected from macroeconomic growth analyses with respect to the wider effects of actual proposed investment projects, and it deepens and widens some of the work that was done in the 1970s on methods for assessing the economics of rural road projects. While less likely to make for savings in aggregate roads spending than in OECD countries, applications in the developing countries could help to improve the allocation and impact of expenditures.

36. The key message of the research is to recognize two points:

- First, for the benefits of transport infrastructure improvement to exceed those calculated in conventional user-cost savings analysis, the project must cause improvements in the competitive structure of transport services and/or of other economic activities in the areas linked (especially the weaker one).
- Second, for benefits to accrue to the weaker of the regions linked, other complementary interventions are likely to be required. Evolution over time of the distribution of benefits from a transport improvement (between consumers, property owners, workers, manufacturers, etc. as well as between regions) will strongly affect its poverty impact.

37. The approach thus seeks to elucidate how a proposed transport investment will affect the local economy. It begins with identification of instances where prices and charges (whether for transport services – including their environmental side-effects – or for other main goods and services produced/consumed in the area) depart from marginal social costs, and then seeks to trace the specific mechanisms by which the transport changes could affect competition and thus reduce these departures from marginal social costs. The consequent changes in structures and scales of production and employment would clearly represent impacts (whether positive or negative) additional to the costs

and benefits calculated in standard cost-benefit analysis based on the assumption of only limited departures from the theoretical framework of perfect competition.

Infrastructure investment, concentration and patterns of settlement

38. A third dimension of the economic geography work relates to patterns of settlement across a country's space, both distribution of population among different towns and use of space within towns. At the national level, excessive concentration of population in a primate city has been found to have negative social and economic effects, affecting the country's urban areas generally, and causing significant sacrifice in economic growth rate.

39. The results of various strands of past research have recently been brought together to make some arresting tentative estimates on the basis of cross-country analysis for 80-100 countries between 1960 and 1995 (Henderson, Shalizi and Venables, 2000 and Henderson, 2000). For medium-sized countries, the optimum share of national urban population in the primate city is found to be 15% at low per capita incomes, with a sacrifice of 0.7 percentage points in GDP growth rate if it is one standard deviation higher – and 25% for medium-income countries, with a sacrifice of as much as 1.6 percentage points of annual GDP growth if one standard deviation higher.

40. The implication is to raise concern not so much therefore about low-income countries (indeed Bangladesh and Congo are identified as the only such countries clearly passing tests for excessive primacy), but to call for careful consideration in countries rising rapidly from low- to middle-income status. And the most important area for attention is the adequacy of growth of the country's transport network: an increase of one standard deviation in national road density is found to yield an 0.25 percentage point increase in GDP growth in the first (low-income) case, and as much as an 0.7 percentage point increase in the second (medium-income). Historical review of the specific case of Chile (where Santiago, with about 40% of national urban population, is widely considered oversized) suggests indeed a long post-war pattern of under-investment in inter-city roads, with adverse consequences for GDP growth rate (Kain and Liu, 1997).

41. While cross-country analyses do not find strong impact of countries' trade policies on primacy, some national studies do identify such impact. Work on Mexico, with a relatively good national transport infrastructure, suggests that increasing openness to international trade in the 1980s and 1990s encouraged dispersion of manufacturing away from Mexico City – and potentially beneficial impact on poverty reduction (Krugman, 1998).

42. Study of the impact of increasing trade liberalization in Nepal, beginning in the mid-1980s, found, on the contrary, further increased concentration of manufacturing in the Kathmandu area, and particularly limited effect on the less developed areas of the country (Sharma, 2000). This pattern was attributed to inadequacy of investment in infrastructure facilities in the less developed regions, a hypothesis which would need testing to identify actual investments, for example in transport, which could have yielded satisfactory economic returns. These researches exemplify the importance of in-country infrastructure for securing pro-poor impacts from globalization, as recognized in DFID's second White Paper (DFID, 2000).

43. At the level of the individual city, research suggests that the key to an efficient pattern of spatial development (only very rarely fulfilled until now) is, to an even greater extent than at the national level, establishment of, and adherence to, a long-run transport arteries framework, within which land is developed (and redeveloped), largely by the private sector, for all other purposes. But in the management of this framework, much more realistic attention than in the past has also to go to the needs of the poorer parts of the population – and hence to such matters as the pace of new land development for their accommodation, a system of safe routes for non-motorized transport, and gradual strengthening of priorities for buses as streets become increasingly crowded (Serra, 1998; Willoughby, 2000b; World Bank, 2001b).

V. Experience with Infrastructure Reform

44. Most of the experimentation by developing countries with new approaches to the organization of infrastructure development has occurred since the end of the historical periods analysed in the research reviewed above. The new approaches have emphasized:

- unbundling of vertically integrated services
- privatisation of many of the resultant units,
- competition among them,
- regulation independent of government (ie. separated from main-line political authority), and
- decentralization to local governments of responsibilities for much general-purpose local infrastructure.

45. An important recent addition to these concepts has been that of active participation of citizens, and especially of the poor, in deciding and monitoring actions taken; with roots much further back, this dimension has been brought to greater prominence as a combined result of political evolution within the countries themselves and the international community's effort to increase the effectiveness of external aid in actually improving the situation of the poor in the developing countries .

International experience with reform and private investment has differed between regions

46. Regions of the world have differed substantially in the degree to which these reform ideas have gained wide acceptance, with Latin America most advanced, South Asia most hesitant, and other world regions falling in between. Foreign private capital flows are a very imperfect indicator of reform efforts (significant proportions have, for instance, been for creation of independent generators selling to only partially reformed national utilities) but they have been very substantial, at about \$550 billion over the decade 1990-99, compared with total official aid flows to infrastructure in the same period estimated at \$150 billion (World Bank, 2001c).

47. Of the total private flows, about \$ 245 billion went to telecommunications, \$ 180 billion to energy, \$ 100 billion to transport and \$25 billion to water supply and sanitation. The substantial scale of the flows is all the more impressive when account is taken of the large political efforts that were necessary to reassure the employees of the traditional public sector monopolies and to convince the general public of the wisdom of such a sharp reversal to earlier policies; more effective political leadership along these lines remains a high priority in many countries, especially in South Asia and Africa.

48. Despite a sharp drop in private flows following the Asian and Russian financial crises of 1997 and 1998, they were still in 1999 eight times the level of official aid to infrastructure in that year – in contrast to the position of virtual parity between private and aid flows to the infrastructure sectors in 1990. As much as 80% of the aggregate private flows in the 1990s went to six upper-middle income countries – Brazil, Argentina, Mexico, South Korea, Hungary and Malaysia. More indicative of possibilities for the future, however, is the fact that more than 120 countries, the large majority of the developing world, received some private investment funds.

Examples of impacts on the poor

49. It is too early for any comprehensive review to have been made of the impact of these reforms and capital flows on the poor, but some indicative country cases can be cited. The principal impact has been in increasing efficiency and improving quality of services offered and, in particular, reducing the extremely severe constraints on new connections that resulted from earlier public sector mismanagement and budgetary stringencies. These effects must have benefitted economic growth and employment, and will in some cases have increased service directly to the poor. Two examples are drawn from the telecommunications sector, the largest recipient to date of reform efforts and capital flows:

In Tanzania, the government sold a 35% stake in the national operator TTCL to the private sector, and licensed four competing operators in the cellular market. In the five years following these reforms, the number of fixed lines rose by 80% from 91,000 to 165,000, while cellular subscribers grew to 110,000. Over the same period, the call completion rate rose from 36% to 58%. (World Bank, 2001c).

In Peru, the government sold 35% of its two state telephone companies to a Spanish operator with five-year exclusivity provisions. In the five years following sale, the number of fixed lines increased 165%, the number of mobile lines rose from 20,000 to nearly 500,000, and the number of locales with access to telephones more than doubled. The percentage of low-income households with telephone increased by a factor of 20, in part, perhaps, because of a gradual shift, incorporated in the original contract, to halve residential connection charges (to \$250 equivalent) while more than doubling basic monthly charges (to about \$15) to better reflect cost structures (World Bank 2001a; Estache, Foster and Wodon, 2001; and Torero and Pascó-Font, 2001). Introduction of telephone services to 5000 small rural towns, previously unserved, continues to progress rapidly thanks to award of 20-year non-exclusive concessions, won on the criterion of lowest subsidy demanded – with the subsidy being financed out

of a 1% levy on gross operating revenues of telecommunications companies (Cannock, 2001).

50. While a major purpose of reform and privatization of existing entities was to increase efficiency, this cannot always be gauged by resultant price reductions. In some cases, improvements on previous unreliability and voltage fluctuations of power supply, for instance, were even more important – and studies often indicate that even poor people are quite prepared to pay a reasonable price for such improved supply. In other cases, the picture is confused by other simultaneous changes unrelated to the utility reforms. Some instances where it is clear that the price reduction resulted principally from the sector reform are as follows (Estache, Foster and Wodon, 2001):

In Argentina, the average retail price of electricity for residential customers (net of taxes) dropped from an average of US\$0.19/kwh (at constant 1997 prices) before 1991 to less than US\$0.12/kwh five years after privatisation – mainly as a result of the coming on stream, in a competitive environment, of new power generators, total number of which increased from 13 in 1992 to 44 in 1997.

In Chile, when the long-distance market for telecommunications was liberalized in 1994, call prices dropped by more than 50% (80% for large clients). A drop in prices of a similar magnitude occurred in 1998 in the mobile telephony field when the PCS system was introduced and the number of mobile telephone companies increased from two to four.

In Buenos Aires, water and sanitation services were concessioned in 1992 to an international company that won the bidding by offering the lowest tariff. Tariffs were reduced on average by 27% and remained some 17% below previous levels even after a renegotiation that became necessary a few years later to bring forward investment plans and improve service quality.

Recent analysis of the performance of the Côte d'Ivoire electricity company, privatised in 1990, indicates that the gains in total factor productivity were largely passed on to consumers in price reductions (Plane, 1999).

The quality of concession contracts and regulatory supervision is critical for the impact of utility privatisation

51. Initial research on experience with some of the large utility companies privatised in the first half of the 1990s seems to demonstrate rather emphatically that the volume of benefits to the national economy, and in particular to the poorer part of the population, depends directly on the quality of the concession contract and of subsequent regulatory supervision. Government failure to fulfil regulatory commitments is generally identified as a main factor in high-profile cases where privatisation results were considered disappointing (eg. Brazil and Mumbai electric power).

52. As regards more systematic research, a study covering telecommunications performance of 30 African and Latin American countries 1984-97 found privatisation by itself to be associated with an increase in payphone penetration but a decrease in mainline penetration and exchange capacity (Wallsten, 1999). Competition was found to be associated with increased mainline penetration, payphones, and exchange

capacity, and with lower prices for local calls. And privatisation combined with the presence of a separate regulator was associated with increases in payphone penetration, exchange capacity and labour efficiency (less employees per main line).

53. Application of a computable general equilibrium model to the initial performance of privatised electricity, gas, water and telecommunications in Argentina results in an estimate of 0.9% of GDP for the overall efficiency gains from privatisation, distributed among all income groups, and an estimate of 0.35% of GDP for the effects of regulation, with, understandably, a larger share of the latter accruing to the low-income population (Chisari, Estache and Romero, 1999). Inclusion in the concession contract for water and sewerage service in La Paz/El Alto in Bolivia of a specific obligation to meet targets for new connections in poorer neighbourhoods is considered the principal reason why such connections rose from 10,000 annually before the concession to 17,000 after it, for water, and from 6,000 to 10,000, for sewerage (World Bank, 2001c).

Patterns of private foreign direct investment

54. Private capital flows have been much less relative to official aid flows for infrastructure sectors other than energy and telecommunications. Within the transport sector, however, they have been substantial for railways and ports – with generally major positive effects on efficiency, benefiting trade and reducing the heavy burdens earlier placed on government budgets – and they have been rising for airports.

55. Increased domestic privatisation has taken place in some countries for urban and inter-urban road transport services. While reforms have been underway in many countries in management of the road system, few have had extensive successful experience with attracting substantial foreign or domestic private finance into road building (mainly China, Brazil, Korea, Malaysia, Chile, Argentina and Colombia). Besides a number of earlier bad experiences due to overoptimism about traffic and the tolls that would be acceptable (Hungary, Mexico, China and Thailand, in particular), this may reflect unrealistic contractual expectations and regulatory arrangements (Estache, 2001) as well as the inappropriateness of most roads in developing countries for development as toll facilities. Private international involvement in the water sector has been much more widespread, but much of it limited to operations and maintenance concessions, major investment responsibility resting with the public authorities.

The role of official development assistance... sharply declining and shifting towards social fund models

56. While reform has been dominated by the efforts to attract large private investors into infrastructure, there have also been some distinctive contributions through aid flows, most particularly in innovative ways to associate communities to selection and execution of small local works. While overall aid flows for infrastructure have halved over the course of the 1990s, to only \$ 8 billion in 1999, it appears that some particular categories of aid support have increased – notably that through Social Investment Funds (significant parts of which have been devoted to water supply and sanitation and to small road works), and that for projects dedicated specifically to improvement of rural water supply.

57. Reviewing lending experience in all fields in the 1990s, the World Bank's Operations Evaluation Department stresses the difficulties of actually targeting the poor but identifies some success cases and finds the key characteristics to be community and beneficiary leadership in identifying need and supervising supply, whether by the private sector or the community's own initiative (Evans, 2000). A thorough review of the experience with rural water projects found the only promising approach to development of such leadership capacities was a gradual, village-specific one, drawing on the country's earlier experience elsewhere and, in some cases, on groups already constituted in the village for other purposes; standardized models seldom worked (Parker and Skytta, 2000). First results of a comprehensive review of Social Investment Funds to date concludes that they have been highly effective in organizing partnerships for delivering small-scale infrastructure, with slightly more than proportional benefits going to the poor, but finds the works need to be better integrated with the relevant sector institutions and the participative approach to be refined – and spread – for larger impact (World Bank Operations Evaluation Department, 2001).

VI. Issues for Increased Attention

58. The overriding priority for improving access to infrastructure for the poor is therefore to diffuse more effectively the generally promising results of the 1990s' wave of infrastructure reform and to work out, with concerned stakeholders and potential foreign partners in all countries, approaches which take advantage of the lessons of experience to date and also respond to their own specific circumstances. In light of the general research reviewed above, and more specific studies referred to in the text below, the following paragraphs highlight a few issues which are believed to merit particular attention.

Adequacy of infrastructure investment levels and institutional structures

59. While most of the points below relate to ways of improving supply of infrastructure services directly to the poor, an overriding consideration – as important for the poor as for other categories of the population – is the need for real progress in efficiency of management of the very large assets dedicated to the infrastructure sectors. The cross-country and regional growth research discussed in Sections II and III shows that infrastructure investment has indeed been important in supporting economic growth and successful poverty reduction programmes, and that it may be particularly needed in countries, and regions of countries, rising from the lowest income levels. But such analyses as have been possible taking account of efficiency in resource use and service provision show that this makes a large difference to the ultimate impact of the investment.

60. Recent analyses of a number of different country situations have expressed fears of significant underinvestment in infrastructure. Studies touching on the effects of macroeconomic structural adjustment programmes on infrastructure suggest that investment in essential facilities was wisely maintained in Mauritius (Rivière, 2001), but that expansion of infrastructure services, especially to the poor, suffered in India and Pakistan as a result of efforts in the 1990s to reduce the growth of public investment (Herrera, 2001). The case underlines the need for the greater pace of reform and more supportive conditions for private participation which could have eased the investment

constraints. Major efforts have been underway in India in recent years to accelerate the slow progress in upgrading trunk highways which underlay the striking research findings mentioned in para 9.

61. In Latin America, there is concern that economic growth has been suffering from inadequate investment in infrastructure in the second half of the 1990s – less than 2% of GDP, little more than half the levels of the middle 1980s – in Mexico, Argentina and Brazil (Servén, 2001). These low investment rates reflect problems specific to each country and, most generally, a less effective pursuit of reform and private investment in infrastructure than followed in Chile, Colombia and, more recently, Peru – in all three of which overall investment in infrastructure has returned to the levels of the mid-1980s or exceeded them. Africa still faces major difficulties in effective mobilization and application of funds from infrastructure users to ensure adequate maintenance of existing facilities and avoid increase of the cumulative loss that is already evaluated at some \$45 billion, for roads alone, due to neglect and collapse of pavements (Gwilliam, 2001).

62. Without adequate maintenance, and judicious extension of main trunk systems to meet the needs of industry and commerce, economic growth and employment expansion are truncated, and the possibilities of increasing infrastructure and other services to the poor are pushed yet further into the future. Therefore institutional structures capable of raising from infrastructure users, and from other sources, funds sufficient to maintain and expand customer-responsive infrastructure services are the single most important factor in enabling infrastructure to contribute most effectively to pro-poor growth. Broad institutional improvement continues to demand sustained attention in many countries.

Competition among providers, and choice for users

63. Competition among potential providers can be the strongest force for securing better infrastructure services to the poor, just as it has been in many ways the most successful element of reform experience to date – for instance in electricity generation.

Competition needs to go much beyond the concession bidding stage. Concessions with long exclusivity periods have been virtually abandoned in telecommunications, and the need for them in electricity should be closely questioned (Brook and Smith, 2000). Much the same applies in urban transport, where some regulation is usually required but relatively short franchises for bus service on bundles of routes appears to give better results than long-term citywide concessions (World Bank, 2001b). Even in the water supply sector, technological change and sheer existing realities in many developing country cities throw increasing doubt on the merits of the twentieth-century tradition of granting exclusivity (with uniform technical standards for all water consumers) to single monopolistic providers, as means to achieve scale economies and avoid duplication of pipe networks (Tynan, 2000).

64. Where competition, existing or potential, exists, regulators need to shift emphasis from traditional financial supervision that is needed for monopolies to ensuring access for potential competitors, avoiding collusion among providers and reviewing the appropriateness to local conditions of traditional technical standards for works. Competition should be promoted in distribution and retailing of electricity and in development of service to rural areas, often off-grid (Brook and Smith, 2000). The

possibilities offered by new technologies in power load management, payment systems, shared use of distribution networks, and distributed generation add to the desirability of more open competition. Rapid spread of photovoltaic systems in Kenya – now serving more rural households than the official Rural Electrification Programme – has been due to strong competition among eight private companies offering them; supply is taxed (with 30% import duties), rather than subsidized (Webb and Derbyshire, 2000).

65. Small local providers (private companies or community-based organizations), which have been generally disregarded at the time of water company concessioning (despite the sizeable role they have often been playing), may be particularly important because of the time it will take to extend central supply networks. Because they were working competitively the more experienced of these providers have been more enterprising than the state utilities in designing their works, services and collection procedures to fit with the particular needs of their clients, and the latter's ability to carry out part of the work themselves.

66. Evidence from a number of countries, including Paraguay and Guatemala (Solo et al., 1999), Haiti (Constance, 1999) and Mali (Collignon and Vézina, 2000) suggests that, with recognition and measures to maintain competition, the small urban water providers can often offer unit prices not more than 2-3 times the main utility's often subsidized rates. In view of the importance of competition and the limited regulatory capacity in developing countries, the concept of the multi-utility – gaining certain economies from combined provision of several services – can be expected to have relevance only in specific cases, such as an isolated area with little existing service in any field (Sommer, 2001).

67. Placing so much reliance on competition among principally private-sector suppliers for meeting the needs of the poor is sometimes considered illogical, on the grounds that the private sector responds to what people are prepared and able to pay for and the poor, by definition, have very limited means. The fact is, however, that the public-sector providers have often not in fact served the poor significantly, and most of the consumer subsidies they provide go to better-off classes of the population. Moreover, there is growing evidence that open competition indeed yields more efficient solutions, bringing cost of service down to levels compatible with smaller household budgets.

Local capacity building

68. Addition to the general paradigm for infrastructure management of the concept of participation by communities in selection of priorities, implementation and monitoring, and the rise of local NGOs and community-based organizations which it both reflects and reinforces, is a major improvement to earlier top-down approaches, and needs to be spread. Development of the capacities of communities for organizing equitably, for reaching genuinely shared positions, and for converting these positions into effective impact on action, such as has been fostered by donor-supported Social Investment Funds and other projects in some of the poorest regions of countries (World Bank, 2001a; Constance, 1999; Parker & Skytta, 2000), is not a rapid or easy process.

69. Sustained support is needed, too, to enable community decisions to become increasingly objective, well-informed and focussed on key problems confronting the community, yet without running ahead of what the membership, almost necessarily

lacking high levels of formal education, is able to cope with; more attention often needs to be given to the quality of interaction provided by the staffs of technical ministries and agencies (World Bank Operations Evaluation Department, 2001).

70. A recent case study of a conventionally prepared rural road upgrading that had little economic impact makes a convincing case that serious consultation with village inhabitants about their transport needs could have yielded solutions (eg. hardened tracks and paths, footbridges, assistance with procurement of non-motorized vehicles) that would have yielded greater impact, at much lower cost (Mahapa and Mashiri, 2001). The suggestion is increasingly made that efforts to reinforce a community's social capital should sometimes precede initiation of an infrastructure investment (Parker & Skytta, 2001) or that funds from one or two planned infrastructure projects should be saved and devoted to efforts to develop or redevelop community capacities (Colletis-Wahl & Meunier, 2001)

71. Rather limited attention has gone in recent years to strengthening the capacities of local governmental authorities. Yet it is they which set the overall pattern and framework for land development and public transport services, and they are directly responsible for most of the infrastructure not provided by utility companies, such as flood protection and storm drainage, local roads and general public facilities (Serra, 1998). A review of transport for the poor in Karachi, for example, points out that while the private sector has developed limited services, only the municipal authorities can deal with many of the problems confronting the poor, such as lack of routes, poor quality of roads, no provisions for bus stops, and physical danger from competition among drivers (Urban Resource Centre, 2001).

72. Decentralization of government development authority has also been underway in most countries, but often with disequilibria arising between responsibilities, financial resources and accountability mechanisms. Much more attention is needed to building up the human capacity of local and municipal levels of government for planning the development of their area (para. 43) and coordinating implementation, developing and enforcing realistic land-use and building standards, resolving the status of "illegally" settled areas, maintaining good registers of property ownership, improving their taxation and financial management capacities, moving the city towards creditworthiness, and ensuring adequate sources of such market financing (Parker and Serrano, 2000 for earlier stages of municipal development; World Bank, 1998a for larger towns and cities, closer to being able to tap commercial sources of finance).

Infrastructure and the Millennium Development Goals

73. It has long been realized that complementary actions and investments in other fields are often necessary to get best results from infrastructure investments, and that, in poor areas, the development of these actions will often require government initiative. But not much progress has been made in developing handy ways of identifying the one or two complementary initiatives that are most essential in any given case. Specific search is needed, but it is important to include in this consideration possible social as well as economic initiatives.

74. For example, the Vietnam study referred to in para.26 indicates that the presence of a village road increased primary enrolment by about 12% and secondary enrolment by

about 24% in poorer provinces, but only by some 8% and 15% respectively in richer provinces (Deolalikar, 2001). Well-documented studies of Morocco (Khandker, Lavy and Filmer, 1994 and Levy and Voyadzis, 1996) have found that the existence of a paved road in a community increased girls' probability of attending primary school by 40%, and that paving of a rural road typically increased the enrolment rate for boys by 25% while more than doubling that for girls, which nonetheless remained significantly lower than that for boys (50% versus 80%); further effort was thus needed to make it possible for families to release their girls for school.

75. Similar findings exist from other countries for the positive impacts of services such as roads, water and electricity on education and health (Lavy et al., 1996; Edmonds, 1998; I.T. Transport Ltd., 1999; Drèze and Kingdon, 1999; Wagstaff, 2000; World Bank, 2001c). Sometimes the results of such studies even suggest that indirect solutions are more effective than direct ones. For instance, a large study of nutrition issues in a sample of very poor areas across Pakistan showed that raising mothers' general education level and improving water/sanitation services were more effective steps to improving child nutrition than provision of more, or less expensive, food (Alderman & Garcia, 1994).

76. Many of the major health and education problems to be resolved mainly by infrastructure services are precisely the ones borne principally by the poor: for instance, the 500,000 premature deaths (8% of total deaths) among women and children in India caused by indoor air pollution due to use of traditional biomass fuels for cooking (Smith, 1999), or the 15% of all deaths among children under five that are due to diarrhoea and which can be substantially cut by improvement of water supply, accompanied by adequate hygiene education.

77. As in areas of potential economic impact, so in areas of potential social impact, particular attention is needed in infrastructure projects for poor areas to ensuring a limited number of complementary initiatives to help attain the largest impact (and, of course, to minimize negative side-effects such as increased accidents, disease transmission or pollution).

78. Equally, social-sector projects need to give explicit attention to the important part that should be played by infrastructure sectors in contributing to achievement of the Millennium Development Goals relating to health and education; infrastructure improvements need to be called upon more frequently as substitutes and complements to initiatives in the social sectors.

Incorporating poverty reduction into infrastructure priorities

79. More work is required to help countries establish priorities for extension of the various infrastructure services to poor people, and reach sound decisions for broad allocation of the country's resources. Actual investments will be significantly influenced by expressed preferences of communities and the initiatives of private providers and suppliers. But those decisions will be made within the framework of the overall strategy for reduction of poverty established by the government, including assignment of budgets for programmes that it would support, whether multi-sectoral (eg. Social Investment Funds) or sector-specific (eg. rural water/sanitation). Thus it needs to have broad numbers in mind.

80. The most fruitful approach is one building on the emphasis in the concept of pro-poor growth on enabling the poor to participate more fully in the economy and hence to raise their incomes. Thus the likely consequences for the poor of securing improved service/s need to be analysed. The most useful way of doing this may be to develop small cost-benefit analyses for a sample of currently little-served villages and slum areas in different parts of the country.

81. On the benefits side, the main focus would be on potential production volumes (not only agricultural), costs and prices (as in the approach described in paras. 35-37 above), on generation of lasting jobs, and on participation in education, time savings (especially in procurement of water and fuel), and health status. Care must be taken to base estimates of production impact on actual past experience in contiguous areas, or comparably hard data, in order to avoid the overoptimism, especially regarding agricultural effects, which has contributed to overdesign of low-volume roads in many developing countries (Gannon & Lebo, 1999). The work would take advantage of any recent research on actual experience of user response to service and might consider alternative combinations/phrasings of service provision. It would normally include tentative identification of complementary investments/actions that should accompany the infrastructure upgrade, if undertaken.

82. Figures on the numbers of poor people expected to benefit in each location should also be included. A series of small reports of this nature would enable the government to compare the expected economic rates of return with those of other public or private projects currently planned or underway – and also to give any additional weight desired to the number of poor who would be receiving improved service.

83. On the basis of such benchmark analyses it should be possible to establish a few simple indicators by which villages and other concentrations of poor people could be selected quite easily as *prima facie* priority candidates for different types of infrastructure service in the immediately forthcoming period. Final selection, and the actual combination of services that would be provided, would, for most services, depend on initiatives by the communities concerned and the private-sector infrastructure providers.

84. While it should not normally be necessary to do more elaborate economic analysis of these schemes at the time of approval, provided that the communities had indicators consistent with those of the *prima facie* candidates, it would be highly desirable to make a thorough economic analysis of some of the schemes a year or so after their execution to verify actual costs and emerging benefits and their consistency with planning assumptions. The analyses would also help to identify generic issues most in need of further clarification and research before a new round of sample cost-benefit analyses a few years later.

85. Sometimes it is suggested that the commitment to the poor under the Millennium Development Goals should be incorporated into the analysis by weighting benefits accruing to the poor more highly than those to others (van der Walle, 2000), or should even obviate the need for efficiency analysis since effectiveness in reaching the poor with support that they value is the overriding criterion for such programmes (eg. Amis, 2001 and Jack, 2000).

86. Such approaches might occasionally be appropriate in countries confronted with a relatively limited poverty problem and great income inequalities, such that straightforward redistribution of welfare could extend to the spread of infrastructure services. But for the countries containing the vast majority of those who need to be helped to rise above extreme poverty levels, it is essential to look for more sustained income and production impact from expansion of infrastructure services. The weighting of benefits to the poor is designed to reflect the policy objective of altering the existing income distribution in such a way that interactions with efficiency objectives can occur.

87. One fear, however, is that the weights might be manipulated (and difficult questions do arise regarding appropriate treatment for different groups at different levels of poverty), but it is also a matter of concern that resultant rates of return would be less comparable than they are now for other purposes such as coverage of debt-service and generation of funds for further investment. It is better therefore to show separately the numbers of the poverty target group covered, and to concentrate the planning and design effort on developing schemes which will secure substantial impact for the poor, generate resources to help spread the effort to cover more of their number, and compete on an equal basis with other public investments in the country.

Reducing subsidization of the non-poor

88. Greater stress needs to be given in all quarters to the importance for pro-poor growth of reducing the very large subsidies still provided to higher-income users of infrastructure in the developing countries. Steady reduction would substantially ease the constraints on provision of infrastructure service to the poor as well as on other poverty-reducing programmes, and would at the same time improve the efficiency of the economy, aiding growth and generally encouraging use of more labour-intensive, less equipment-intensive techniques.

89. Two types of subsidy are in question:

- The one which is normally referred to is the direct financial subsidy visible from the books of the utilities and the government. Energy supplies have been the largest medium of such subsidies. Aggregate energy subsidies in the developing countries are believed to amount to about \$200 billion per year, falling slightly due to adjustments toward world-market prices in some energy-producing countries and to utility price rationalizations taking place in connection with privatisation (Albouy and Nadifi, 1999). For subsidies passing through utilities, whether on energy, water or other services, studies show that, in poorer developing countries with only limited networks, the beneficiaries are almost entirely the higher-income groups, and that even in the better-off developing countries, with a more significant share of poor households connected, half or more of the subsidies in fact go to higher-income people (World Bank, 2001c; Swyngedouw, 1995).
- The other type of subsidy, whose significance is gradually being realized, consists of negative effects that infrastructure users impose on others in forms

such as health-damaging pollution, noise, traffic accidents and congestion. The considerable work that has been done on these issues in OECD countries shows that such unrequited external costs of road transport are equivalent to several percentage points of GNP, and serious efforts to have more of them recovered from road users are being made, notably by the UK government and the EU commission (Commission of the European Communities, 2001). Various independent assessments were made in the 1990s for a number of developing-country cities and indicate an equally high burden as a proportion of regional income, with indications moreover of the poor carrying a disproportionate share of the consequences (Willoughby, 2000b). The World Bank's energy sector strategy argues that it should be the objective of all countries to integrate local environmental and social externality costs into energy pricing (World Bank, 1998b). And its urban transport strategy paper puts great emphasis on the same point for urban transport, especially road users, more generally (World Bank, 2001b). But much remains to be done in these areas, of great potential significance for more pro-poor growth patterns.

Targeting subsidies

90. There is great need for more inventiveness in designing infrastructure solutions that will best respond to the particular needs of different groups of poor people in the developing countries and that will make best use of any subsidies available. Most countries have social welfare objectives that recognize the desirability of some income transfer from rich to poor; while it is commonly agreed that this is best done in the form of general income supplements, administrative infeasibility causes policy-makers to turn to infrastructure services as an alternative channel.

91. In addition, use of infrastructure services quite often involves positive externalities – such as cleaner environment in the case of sanitation facilities, or reduced pressure on increasingly scarce timber resources near to towns and villages in the case of energy services. The difficulties are in combining good targeting of the subsidies to the truly poor with promotion of a flexible, inventive approach to meeting their needs and a reliable source of subsidy funds.

92. The traditional approach has been to provide the poor (at least those of them who were actually connected) a standard service, and to offer “lifeline” rates for low consumption volumes, cross-subsidized from higher prices for larger consumers. In practice, in the conditions of developing countries, most of such subsidy goes to the non-poor – and even some of the poor, living in larger families or groups, or doing home production, do not benefit (Barnes and Halpern, 2000). Reliance on cross-subsidization is also incompatible with liberalization and competition among providers.

93. Some Latin American countries have developed one form or another of means testing to better target such subsidies, but recent assessments indicate that even these systems suffer from errors of exclusion or inclusion of large proportions (Estache, Foster and Wodon, 2001).

94. An interesting and seemingly successful approach to the promotion of new power connections has been the Chilean programme which, within five years, raised rural electric coverage from 57% in 1994 to 75% in 1999, benefiting 113,000 households

(Estache, Gomez-Lobo and Leipziger, 2000). Concessions were awarded to the company offering the largest discount on the maximum allowable subsidy calculated by the government on the basis of the difference between estimated social and private returns for each project. The service expansion was thus cofinanced by government (\$112 million, out of its general budget), the private sector (\$60 million) and the rural consumer (Tomkins, 2001). The concessionaires were free to choose the technology they considered most appropriate. The high costs of connection, the efficiency gained by connecting all households in a village simultaneously, and the relative ease of accurate one-time identification of the poor all point to the advantages of concentrating government financial support on connections instead of regular consumption, with responsibility for execution of the work being assigned competitively against basic performance specifications rather than prespecified designs (Barnes and Halpern, 2000; Brook and Smith, 2000).

95. Very similar issues to those discussed arise in connection with better-adapted design of urban transport services, but the targeting of subsidies (more substantial than those on other utilities) normally requires regular provision of entitlements directly to those eligible (more feasible in a town); a specially important issue in many cases is to find a reliable arrangement for compensating the service provider for the difference between full and subsidized prices of the tickets used by those with entitlements (World Bank, 2001b).

96. But what is appropriate for Latin America in this area will often not be directly applicable to poorer countries. Chile, for example, is estimated to have less than 2% of its population in the MDG poverty target group, and 18% living on less than \$2/day. It is understandable that it would afford significant subsidy programmes to counter poverty. Peru has about 15% of its population below \$1/day. But those living on less than \$1/day account for well over half the population in many sub-Saharan African countries and for 30-40% of the population of many other African countries as well as the most populous South Asian countries (World Bank, 2001d). In these circumstances, connection subsidies that may be appropriate to the inegalitarian Latin American countries could at best benefit a very small part of the target group – and would in fact probably be captured within a few years by landlords not belonging to the target group.

97. On the other hand, the World Bank's review of rural water projects (Parker & Skytta, 2000) makes it clear that, even though they were typically directly serving the 60-85% of the population who were better off, the best efforts at cost recovery had nowhere (with the possible exception of China) met projections, nor generated funds sufficient for major equipment renewals and replacements. It may be easier to justify subsidies for these particular purposes on grounds of the external economies of better water and sanitation. However the main conclusion must be to recommend a cautious approach even to targeted infrastructure subsidies – whether through Social Investment Funds or sectoral projects – in the countries facing the largest poverty problems. And since some of the subsidy commitments may build up over time, it is important for government to keep a tally of the obligations it is accumulating.

Reducing corruption

98. Public infrastructure agencies in many developing countries have accumulated patterns of corrupt practices that impose huge costs – estimated, for example, at \$100

million annually in the case of the two main Bangladeshi power companies. The costs usually fall heavily on the poor – in the form of slow spread of network coverage, concentration of shortages on remote and politically less sensitive regions, and higher than necessary prices.

99. Aid donors have begun to recognize more clearly the nature of these problems and the part they could play in helping to resolve them, but more needs to be done to achieve effective coordinated action. Broad development of the domestic constituency for reform – educated electorate, active associations of citizen groups including the poor, forward-looking private business sector, genuinely free press, stronger judiciary, ginger groups within the civil service itself – is crucial to building the needed political foundation and developing acceptable solutions.

100. But joint donor action in support of the movement is most particularly required in the case of agencies that have been, or are, major users of donor funds, and that have developed a structure of corruption tightly linked, through staff appointments and sharing of bribes, with politicians and the financing of party activities. Infrastructure agencies often share both characteristics. A recent review of the corruption problem in the energy field, and of efforts to overcome it, concludes that the only promising solution for power distribution agencies severely affected may be full privatisation. Experience indicated that half-measures, such as contracting out of billing and collections, or management contracts with private parties, had had only limited impact on the strongly entrenched and well-protected promoters of earlier bad habits (Lovei and McKechnie, 2000).

Assistance for adjustment

101. It is important to maintain a careful and open approach to the possibility that some will be seriously adversely affected by changes in infrastructure arrangements and to seek ways of easing the transition for them. This applies to better-off groups whose political support will be crucial to activating the reform, but is obviously particularly important for families in the lower half of the income distribution.

102. A recent World Bank review of the welfare consequences of major utility privatisations to date in the developing countries reaches generally optimistic conclusions (World Bank, 2001e). It found the clearest positive impact in increased pace of provision of new connections, and the most doubtful aspect to lie in the arrangements made for those who lost their job at the utility in the lead-up to privatisation or subsequently; service prices present a more confused picture, but there was certainly no evidence of major unjustified price increases. Nonetheless, given the seriousness of past underpricing and overemployment problems under public management, which are the major reasons for devoting so much attention to privatisation, it is only to be expected that some individuals will face serious adverse consequences – just as some do from upgradings of basic infrastructure.

103. Good examples can be cited of sensitive and flexible handling of these problems – often by combined efforts of public sector, private sector and NGOs – even when they arise on a large scale: in the case of resettlement, and compensation for property loss, the Jamuna Bridge project in Bangladesh, and Suburban Rail Upgrading in Mumbai; in the case of labour retrenchment, the concessioning of the Brazilian Federal Railways in

1995 (Willoughby, 2000a; Estache, de Azevedo and Sydenstricker, 2000); in the case of price adjustments, the revised connection charges that were negotiated between the government and concessionaire for Buenos Aires water and sanitation services in 1997 (Estache, Foster and Wodon, 2001 and Tynan, 2000). People likely to be seriously affected by changes should be kept informed of evolving prospects (ILO, 2000), encouraged to consult with one another and contribute to the shaping of the change (Harsman, Pädam and Wijkmark, 2000), and given special consideration by final decision-makers to ease their adjustment to the extent possible.

Priority for landlocked countries, isolated regions and the least developed countries

104. Pursuit of pro-poor growth must involve priority attention by the international community to the needs of the landlocked developing countries (not very populous but almost all included among the least developed countries as recognized by the UN) and the much more populous, landlocked regions of large, poor countries such as India, China and Pakistan which suffer from many similar problems.

105. The record of the 1990s shows that improvements have been achieved by the least developed countries in most services, but the levels reached remain far below those of other developing countries: only 13% of households having electricity, compared with 75% in other developing countries; four telephone mainlines per 1,000 people, compared with 60; 12% of roads paved, compared with 50%; 60% of their people having reasonable access to safe water, compared with 80% (World Bank, 2001c). Most of the landlocked regions of the larger countries would show comparable contrasts with attainments in other parts of the nations to which they belong.

106. In terms of overall financial flows in support of infrastructure, the experience of the least developed countries contrasts strongly with that of developing countries as a whole: the rise in private flows has been more than offset by sharp decline in official flows, such that overall foreign financing fell from aggregate levels of over \$4 billion per year in the early 1990s, and around \$4.5 billion in the mid-1990s, to little more than \$2.5 billion at the end of the decade. A higher percentage of these countries than of others has received foreign private investment in one sector or another, but private investment in transport and water has been very small (Houskamp and Tynan, 2000).

107. The good results of international private participation in telecommunications, and the promising impacts of international concessioning of a few ports and railways in these countries (UNCTAD, 2001) must be built on, to engender a larger process. One top-priority need is inter-governmental action, which should be amply backed by foreign assistance, to identify, agree and fulfil the measures needed to achieve good transport services for the landlocked countries to the sea (para. 34). Such agreements, or other work on the concept of international transport corridors proposed by UNCTAD, may reveal particular needs for private investment and operation such as the “one-stop border posts” agreed in principle for the SADC region (UNCTAD, 2001). There is also scope for important collaboration between regional governments, aid donors and the private sector on regional projects in other infrastructure fields (World Bank, 2001c).

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