



Infrastructure Planning and Development: Environmental and Social Considerations of Sectoral Reform

The quality of a nation's infrastructure stands as a critical index of its economic vitality. Infrastructure – long-lived public networks, such as roads, water systems, electric grids, and airports – deliver broad benefits to developing economies. They link resources to factories, people to jobs, and products to markets. In any economy, investment in public works infrastructure yields a return that is captured directly in the form of jobs; more, and more efficient, industrial output; increased household incomes; greater access to education; more competitive exports; and the attraction of foreign private investment. Equally important, especially in economies of the developing world, environmental infrastructure investment yields a return in the form of reduced sickness and mortality, a healthier workforce, reduced poverty levels, and increased economic opportunities for women.

But, these benefits are not necessarily guaranteed. In fact, recent studies have demonstrated that the presence of infrastructure in and of itself, is insufficient to deliver broad-based development benefits equitably across households and business of differing income levels.¹ Because these long-lived structures are interrelated with other types of national assets – environmental and natural resources, human capital, and social institutions, for example – governing policies are needed to ensure that appropriate levels of infrastructure investment are structured and priced to deliver direct benefits to target populations while not inadvertently creating costs elsewhere in society.

What sorts of policies help ensure that infrastructure delivers on its promise of broad-based economic, environmental, and social benefits? Experts suggest a range of policies that address infrastructure investment directly as well as policies that govern the relationships between infrastructure and the environment, and infrastructure and social objectives.

Direct Infrastructure Investment Policy

Key policies that govern investment in infrastructure address such issues as:

- How much should a government spend to develop infrastructure?
- Where and in what types of infrastructure should a government invest?
- Who should own and operate infrastructure – strictly the public sector or some combination of public and private enterprises?
- How should infrastructure be financed and who should pay for it?
- How should infrastructure services be priced?

¹ See, for example, the World Bank, *Reforming Infrastructure – Privatization, Regulation and Competition*, 2004.

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Donor institutions can be influential in helping answer each of these questions to assure delivery of adequate quantities of high-quality, reliable infrastructure services. According to the World Bank, for example, on average, developing countries will need to spend seven to nine percent of their GDP to build, operate, and maintain an adequate infrastructure network. This is roughly double current levels of investments. Donor policies targeting direct loan- and grant-financed infrastructure investment as well as those leveraging private infrastructure investment, therefore, would appear to be critical if developing nations are to deliver needed infrastructure services to their populations. Recent analyses have shown, moreover, that some donor policies aimed at bringing international private capital to local infrastructure initiatives have proven unsustainable.² Local private (as well as public) capital investment is critical to sustain infrastructure services.³

But direct investment is not always the most effective way to improve or widen distribution of infrastructure services. Policy interventions that create the enabling conditions for private investment in new infrastructure or private operation of existing infrastructure also can be effective. Of particular importance in this regard are policies that create transparent processes for transfer of assets from public to private owners; predictable expectations for the quality and quantity of infrastructure services; regulatory processes that reward private capital for the risks taken to deliver these services; and rules that enable private operators of public infrastructure to make management decisions (regarding human resources and procurement, for example) consistent with their objectives to earn a reasonable profit. In the early 1990s, for example, Argentina decentralized port operations and authorized private entities to build and operate ports for public use. The largest port in Buenos Aires was divided into six terminals and opened to competition through concessions to different operators. As a result, annual container traffic increased by a factor of three between 1991 and 1997, labor productivity quadrupled, and throughput times were cut in half.

Donor agency policies also can guide distributional effects of infrastructure investment. From an efficiency perspective, the price of infrastructure services should reflect total life-cycle capital and operating costs. But in many developing economies, only the very wealthiest of the population would be able to afford infrastructure services if they were so priced. Donor policies regarding subsidies and social safety nets can help even the distribution of infrastructure services across income groups. In Georgia and Armenia, for example, US AID has supported transformation of relatively inefficient public energy networks to more market-driven private networks. As prices increased to reflect true costs of service, AID cycled back to low-income households and businesses with direct subsidies so that they could pay market rates for electricity and district heat. This approach preserved the normal market flows of services and payments, even as low-income ratepayers simply passed government subsidies through.

Infrastructure and Environmental Policies

Infrastructure is inextricably linked to the environment both by virtue of the physical works themselves and as a result of the services they deliver to the public. Policies that guide infrastructure investment, therefore, can have very positive environmental outcomes or very negative ones. Moreover, there is a temporal dimension to the linkages between infrastructure and

² See, for example, J.E. Stiglitz, *Wither Reform? Ten Years of the Transition*, keynote address, annual World Bank Conference on Development Economics, April 28-30, 1999, Washington DC. Also, the World Bank, Private Participation in Infrastructure Projects database.

³ Insert cite from USAID on India local wastewater capital finance.

the environment whereby even short-run harmony between the two can have longer-run negative impacts.

Environmental infrastructure such as municipal water supply, sanitation, or solid waste management facilities can deliver environmental and public health benefits directly to people and businesses. Policies that encourage investment in and maintenance of these types of infrastructure contribute directly to environmental welfare. Other types of infrastructure designed to store or control water, such as hydroelectric dams, flood control structures, transportation canals, and dredged harbors can have very negative direct environmental effects such as destruction of fish and wildlife habitat, interference with migration patterns of fish and birds, and release of chemical contaminants into the water column. Policies that require environmental safeguards to be designed in to infrastructure projects of this nature can avoid or mitigate environmental losses while concurrently, delivering the same energy, transportation, or flood control benefits to local economies.

Infrastructure also interacts with the environment by virtue of the services that physical structures deliver. The most common example is transportation infrastructure, where roads or airports, for example, can result in direct environmental damages from land clearing, runoff, noise, and emissions from cars and airplanes. But transportation infrastructure also delivers mobility services to people and businesses, enabling development to spread over wider areas, sometimes with the unintended effects of even greater land disturbance, noise, and emissions. Land use policies that govern growth patterns and best management practices to protect waterways from runoff contaminated with chemicals and metals, can be effective ways to protect the environment and deliver mobility.

Transit infrastructure is important for the urban mobility services it delivers, but effective transit development also can have the effect of reducing airborne emissions per capita by enabling urban, peri-urban, and ex-urban residents to avoid using their cars in favor of reduced-emissions surface or sub-surface light rail. Even diesel buses deliver significantly greater passenger-miles per ton of air emissions than do cars. Effective vehicle inspection and maintenance policies or high-occupancy vehicle restrictions on certain motorways can further reduce air pollution without reducing mobility benefits.

There are a number of ways of harmonizing environmental and infrastructure policies – environmental legislation, capacity building in environmental agencies, improved information and transparency, training both at the community level and within infrastructure agencies, and systematic use of strategic environmental assessments (SEAs) at the national and sectoral level. An SEA can incorporate a broad range of environmental issues associated with infrastructure development from threats to water catchments, changes in land use, population growth and relocation, industrial development, and other economic development such as tourism. SEA's can be particularly effective in minimizing environmental impacts or indeed, delivering environmental benefits, while at the same time, delivering other infrastructure objectives such as energy capacity, urban mobility, export capacity, defense, or public health. By incorporating as part of infrastructure planning, initiatives such as local public consultation, consideration of both direct and induced impacts, and appropriate land uses in different environmental zones, SEAs can reduce social impacts and costs by avoiding or mitigating environmental costs before they occur rather than cleaning them up afterwards.

Infrastructure and Social Policies

Over the last decade, it is widely held that infrastructure policies in the developing world have neglected social objectives. Most infrastructure policy during this period has focused on broad economic objectives, such as effective delivery of service flows that result in GDP growth or proper pricing of infrastructure services to assure efficient allocation of financial resources to infrastructure investments. Most infrastructure regulatory efforts have focused on measures of operating performance like labor productivity, service quality, or profitability. Significantly less attention has focused on the distributional effects of infrastructure, and as a result, increased efficiency may well have been delivered at the expense of jobs, the quality of employment, or access to infrastructure services. Although the evidence is mixed, recent analyses suggest more strongly that infrastructure privatization and market reforms have significantly reduced delivery of basic energy, transportation, health, and sanitation services to poor households and disadvantaged groups.⁴

Over the next decade, broadening infrastructure policies to account for social impacts can help correct these oversights. Specifically, economists suggest a reexamination of infrastructure pricing, public subsidies, regulatory design, and spatial access policies.

Subsidy programs in particular can be highly effective where they are targeted properly (to indicators of need, for example), administered at low cost, and open to public scrutiny.⁵ In general, it is widely held that subsidies are most effective when applied after costs have been minimized through competition, regulation, appropriate technology and service standards, or and public enterprise reform. USAID is developing energy subsidy programs in Georgia, for example, that follow these guidelines and have been shown to be highly supportive of local social objectives.⁶

Regulation coupled with pro-poor pricing can be used to reward infrastructure service providers, but still hold them accountable for support of social objectives. Socially inclusive regulation begins with a clear statutory mandate. Helpful regulatory policies include periodic judicial reviews, transparency (publishing) of regulatory decision making, public participation in the regulatory process, and mandatory benchmarking of the regulated community. Slow transitions with differentiated, graduated pricing structures can lead to balanced efficiency and social welfare outcomes.⁷

Central governments must ensure that they maintain sufficient capacity to manage, monitor, and coordinate delivery of regulated infrastructure services in line with pro-poor regulatory frameworks with clear incentives for public enterprise performance. In a recent study of 21 African water utilities, for example, high-quality governance and broad, professional institutional capacity were the most important factors leading to efficient operations and expansion in the number of connections.⁸

⁴ See, for example, Chisari, O., A. Estache, and C. W. Price, "Access by the Poor in Latin America's Utility Reform: Subsidies and Service Obligations," In C.Ugaz and C.W. Price, eds., *Utility Privatization and Regulation: A Fair Deal for Consumers?* Northampton, MA., Edward Elgar (2003).

⁵ Connecting East Asia: A New Framework for Infrastructure. Asian Development Bank, Japan Bank for International Cooperation, World Bank. March 2005.

⁶ Insert reference to the Georgia Winter Heating Program and the targeting work of Bob Baumgartner.

⁷ Price differentiation, sometimes called "constrained market pricing" holds great promise as a way to balance traditional efficiency objectives for regulated infrastructure and social welfare objectives. See, for example: M. Armstrong and R.Rees, *Pricing Policies in the Infrastructure Sectors*, background paper prepared for the World bank's World Development Report (2002).

⁸ A Estache, and E. Kouassi, *Sector Organization, Governance and the Inefficiency of African Water Utilities*, Policy Research Working Paper 2890, the World bank (2002).

Perhaps the best way to ensure broad access to infrastructure services is to empower communities to help plan and manage their own infrastructure. Local communities, for example, can participate in decision making about both local and local portions of large infrastructure networks that touch their community. Civic organizations and NGOs can be trained to detect and root out corruption and vested interests, and play an advocacy role for more sustainable infrastructure polices and services. Reforms in civil society of this nature also help ensure that – once built – infrastructure will continue to delivery services that are relevant to local needs.