



# Selected Issues

Many of the infrastructure reform issues in Asia and the Pacific are persisting, as solutions have been slow to materialize. This reflects implementation difficulties as well as lack of full appreciation of the technical and economic features and some basic principles. The current section recapitulates selected infrastructure issues to bring out their main significance. Some theoretical, practical, technical, and economic issues are reviewed to highlight basic principles and problems pertaining to faulty project or program design.

## A. Changing Technical and Economic Features

Generally, the distinctive technical and economic features of infrastructure are economies of scale and public good characteristics.<sup>18</sup> In many cases, due to economies of scale, a monopoly or natural monopoly offers the lowest cost of production to a society. This leads to public provision of the infrastructure mainly to protect consumers from monopolistic pricing by the private sector. Some infrastructure is provided by the public sector because of the infrastructure services' public good characteristics that prevent exclusion of users and pricing of the services. Some infrastructure investments are too large for the private sector to undertake. Thus, the public sector has traditionally been the lead provider of infrastructure services. However, technological advancements and changes in management practices gradually have altered these features and now provide alternate models. For more than two decades, several successful models with private sector participation in infrastructure have been tried across the world and in Asia and the Pacific.

Two key changes—unbundling of large monolithic infrastructures into smaller components and introduction of excludability in infrastructure services—resulted from changes in technology and management practice. First, the unbundling of infrastructure into smaller components opened the possibility of introducing competition, including participation by the private sector in some or all of these components of erstwhile natural monopolies. However, the degree of competition depends upon the technology and size of the market. For example, whereas the minimum cost of electricity production was previously reached at 1,000 megawatts (MW), it now can be reached at 100 MW. This technological advancement has drastically altered the possibilities of competition in power generation. Second, the change in nature of infrastructure services from public to private goods through introduction of excludability (e.g., toll roads) allows the imposition of user fees or tariffs in areas once seen as pure public goods. These two changes facilitated introduction of competition in what were once natural monopolies, and opened the door for the private sector to operate in previously publicly owned infrastructure sectors.

## B. Reforms and Their Objectives

Several developing countries in Asia and the Pacific have undertaken significant reforms in infrastructure sectors during the last few decades, albeit with wide variations. Resource constraint has been at the core of the reforms. First, there has been an increasing recognition of the high potential for resource saving through improved efficiency and reduced wastage in the operation of infrastructure services. Second, the

total resources required for infrastructure are huge and generally exceed government's fiscal ability to meet them. Thus the need to mobilize private investments by taking advantage of changes in technology and management practice is increasingly seen as important. Accordingly, two key objectives of reforms have been to improve operating efficiency and expand financing options. Another important objective of reforms has been to improve the quality of the services. Private sector participation in infrastructure has also been promoted essentially to fulfill these objectives rather than for ideological reasons.

### **1. Efficiency**

Theoretically, the public sector can provide infrastructure services at the same level of efficiency as the private sector if it operates identically with the latter. However, this has not been the case historically, largely reflecting inappropriate incentives and lack of competition. In the past, most public sector infrastructure agencies were run as government departments, lacking autonomy and professionalism. A popular strategy to address consequent inefficiencies has been to "corporatize" the public sector agency with professional management, administrative and financial autonomy, and commercial orientation, to run the agency like a business enterprise responding to consumer demands rather than a bureaucracy. Corporatization also widens the possibilities of direct private sector involvement and options to raise market finances outside the government budget. Public entities are increasingly being exposed to competition, depending upon technology and market conditions. Where possible, competition is introduced directly through liberalized entry to the infrastructure or its unbundled components. Where monopoly conditions continue, the element of competition is introduced by making the infrastructure or some of its components contestable. This is accomplished by allowing other providers to bid competitively for the right to provide the service for a certain period. Overall, commercialization of public sector infrastructure agencies, unbundling of public monopolies, and entry of the private sector brings in more players and increases competition. Competition in turn brings incentives for lowering prices and improving service quality.

Because the private sector has proven its efficiency in infrastructure services, direct private sector involvement (e.g., through management contracts, concessions, or complete privatization) resulting from above changes add to efficiency gains. The private

sector can run existing or provide new infrastructure services.

To summarize, corporatization and commercialization of public infrastructure agencies, entry of private players, and exposure to a greater degree of competition in infrastructure have been central to improved efficiency and reduced waste of scarce resources. However, experience has been mixed, with results varying among sectors and markets, depending on the characteristics of the sector and the market, some of which are explained ahead.

### **2. Financing**

Because the scope for user fees has been limited in the past, infrastructure has traditionally been financed by the public sector using tax resources. The approach of reform efforts has been to introduce excludability in infrastructure previously treated as pure public good, and to charge user fees. This enables the public sector to raise some funds from the market, and respond to market signals which is more efficient than responding to bureaucratic decision making. More important, introduction of excludability and cost recovery enables the private sector to bring resources into play. Again, the experience has been mixed across sectors and countries. The public sector still accounts for most of the current investment in infrastructure. For example, of the estimated \$27.6 billion total recent annual investment in infrastructure in South Asia, public investment accounted for about \$24.4 billion (88.4%) while private investment accounted for only \$3.2 billion (11.6%).<sup>19</sup>

## **C. Changing and New Institutions**

### **1. Legal and Regulatory Arrangements**

Earlier, the provision of infrastructure primarily involved agreements and contracts between government agencies. Laws and formal mechanisms were not required to enforce contracts. However, new procedures are needed to govern the relationship between new players including the private sector. New legal frameworks have had to be developed to govern new public-private and private-private relationships in providing infrastructure. Because it is not possible to achieve perfect competition in most infrastructure services, appropriate regulation to prevent monopoly pricing has become important with the entry of the private sector. Further, as the parties involved include both public and private sectors, there is a need to have such regulators independent of and outside the control

of the government. The independence and credibility of the regulator plays a key role in reducing the risk perceived by the private sector.

## 2. Role of Government

Reflecting the developments, the role of government has changed, particularly from being mainly a provider to being a facilitator of infrastructure services. While government's direct role in provision of infrastructure has declined slightly, its overall role has expanded and become more politically and technically complex. The government now plays multiple roles in infrastructure development, including

- planning and coordination;
- investments in and operations of infrastructure services directly under its control;
- development and/or administration of traditional regulation to protect the poor and the environment; and
- development and support to new legal and regulatory frameworks, including dispute resolution mechanisms for private sector participation.

The role of the government is further complicated by the new coordination challenges arising from decentralization.

Often, the government must provide at least a minimum amount of some infrastructure. It is not possible to wait for the private sector to enter, as the opportunity cost of not having the infrastructure is too high for society. However, DMCs face tight fiscal positions with limited ability to take on additional expenditure or accept contingent liabilities based on risk sharing. Thus, efforts to increase cost recovery and mobilization of private finances need to be accelerated.

## D. Selected Implementation Issues

Development, operation, and maintenance of infrastructure involve a range of challenges emanating from political, economic, and technical complexities. The region's countries' and sectors' transitions to newer ways of business are at varying stages. The development of infrastructure has been mixed reflecting technical and economic (e.g., degree of public good features and extent of externalities) and market (e.g., size of market, purchasing power, and willingness to pay) features as well as weakness in implementing

reforms due to the lack of application of basic principles, and the complex political economy of infrastructure. Often the political will or capacity of the government to handle the complexities is inadequate. At the same time, blaming all the problems on the government is an oversimplification of the issues. This paper considers the following as some of the important implementation issues.

## 1. Private Sector Participation

The primary factors driving the move toward private sector participation in infrastructure are its two main advantages—efficiency and the capacity to provide additional resources. Private sector participation in this context should not be seen as an ownership issue. Ownership is at best a secondary issue, which, if pursued for its own sake can result in unnecessary attempts to privatize infrastructure that is not feasible. Rather, managing infrastructure is in some cases more important than the issues of who owns it. Financial and economic feasibility should guide such decisions rather than ideological reasons.

The private sector is likely to participate only if there is a market with adequate demand. Income level and market size are two of the critical determinants of the demand needed to attract private sector investment. Ability and willingness to pay are important factors, as the private sector needs competitive returns on investment and will seek user charges commensurate with the level of investment. Private funds may not be available if income levels are low or the market is too small, even when other requisite conditions (e.g., a sound legal and regulatory framework and macroeconomic stability) are present. At the same time, these factors vary across sectors and countries. For example, while telecommunications has attracted significant private investment in some countries, water supply and sanitation and rural roads have not, mainly due to the absence of a suitable market. Infrastructure planning has to be rooted in reality and be commensurate with the income level in the country.

The combination of reward and risk determines the private sector interest. The adequacy of return depends on the level of risk involved. Because of high sunk costs and the long-term returns, most infrastructure projects are considered risky. Consequently, a higher return on investment is expected from infrastructure projects. Good policy, legal, and regulatory frameworks are critical for reducing the risk perceived. An appropriate allocation of risks among the diverse parties involved

(e.g., government and private organizations) is also critical. The newness and evolving nature of the policy, legal, and regulatory framework in DMCs increases the perceived risk. Even in financially feasible projects, in areas or countries without much of a track record, the private sector may consider the risk too high for it to provide any investment. Thus, government has a major role to play in attracting private sector interest, particularly at the beginning of reforms. There is also a need to quickly establish the track record and credibility of newly established legal and regulatory frameworks. Another issue in promoting private sector participation in infrastructure is appropriate structuring of the financing arrangements. The number of failures in projects with private sector participation has been high and renegotiation of contracts and concessions is quite common. Thus, continued refinement of process and the replication of success stories is needed in the region.

An infrastructure project with a good risk-return profile will attract private sector investment, as global funds are seeking business opportunities. However, several infrastructure projects are not financially feasible to begin with. In many cases, even if the market does not offer enough return for the private sector to undertake a project, the government can provide public funds to make the project feasible for the private sector thereby leveraging more private funds for every unit of public funds spent. The public funds provided to fill this “viability gap” need not be seen as a subsidy, but as a way to leverage additional private funds. For example, some infrastructure projects can become viable for the private sector only at user fees so high the public cannot afford them. Governments have no option but to provide the projects. By providing the viability gap fund, part of the cost is borne by private funds and the project also benefits from efficiency gains from private sector participation.

Attempting to introduce competition and private sector participation in areas that are not financially feasible undermines the credibility of reforms. The results of recent efforts to promote private sector participation in the region have been mixed. The flow of private sector funding for infrastructure was much lower than anticipated. It continues to comprise only a limited share of total infrastructure investment in Asia and the Pacific, and the rate and extent of success has varied across the region.

## **2. Regulatory Issues**

While the overall legal and regulatory framework,

including commercial, judicial, and environmental aspects, involves a number of agencies, the main role of a typical infrastructure sector regulator is to regulate monopoly powers, ensure smooth relationships among diverse players (including the government and private investors), promote competition and efficiency, and reduce the risk perceived by the market. The key areas of regulation include the price of infrastructure services, service quality, competition, network access, arbitrary government action, and settlement of disputes. The best practices in regulation include a rule-based and transparent decision-making process, and full independence from the government. However, regulation of infrastructure services is still evolving and the quality varies across sectors. Defining a system to ensure accountability of the regulator is important in the region. Most infrastructure regulators in the region are recently established or new. They continue to face challenges, including institutional capacity and shortage of technical expertise, and difficulties in earning market confidence.

## **3. Subsidy**

At the current level of technology, few infrastructure services are considered financially viable at reasonable or practical levels of user fees.<sup>20</sup> For example, other than in selected high-traffic corridors, toll fees adequate to pay for full construction and maintenance of roads would be too high for users to afford or be willing to pay. Such projects are made feasible for the private sector only with government support. Further, the government may provide subsidy to cater to the needs of the poor and/or protect the environment. Rural infrastructure is also unlikely to generate much or any tariff revenue (depending on the sector), largely reflecting the low ability to pay of the poor living in rural areas. As a result, some rural infrastructure (e.g., roads and water supply and sanitation) depends almost entirely on public funding.

An element of concession/subsidy in the price of infrastructure services is common in DMCs. Often this is necessary for projects to happen or to meet desirable social or environment objectives. Where most infrastructure is still funded by taxes, public support to facilitate their provision need not be seen as a subsidy issue, but as a smart way of leveraging additional private funds. Thus, subsidy need not always be seen purely in terms of market distortion. The financial support or subsidy should have a clear and justifiable purpose, be well targeted (e.g., an output-based subsidy, which depends on delivery of

benefits to the targeted individuals or households), and be administered transparently. Subsidy should be considered only after carefully analyzing the feasibility of all other possible market-oriented options. Given the strong political sensitivity of subsidies, the issue continues to be debated in the region.

#### **4. Maintenance**

Lack of adequate funding for maintenance is a continuing issue in infrastructure and eventually leads to much larger new investments. For example, the return on maintenance expenditure in the road sector is often more than twice that of new investments. Lack of maintenance also results in poor services that cause substantial economic losses. Adequate provisioning for maintenance should be an integral part of design and implementation of any infrastructure project from the beginning. Asia and the Pacific need significant funding for both new investments and maintenance expenditures. As indicated earlier, during 2005–2010, the funding needed for maintenance in the region (2.9% of GDP) is also higher as a proportion of GDP than that of the world (1.2% of GDP). In Central Asia, where maintenance is a most important issue, the funding requirement (4.2% of GDP) is well above that for new investments (2.8% of GDP).

#### **5. Capital Market Development**

Capital market development is critical for commercialization and private sector participation in infrastructure. Most infrastructure requires large sunk investments but with returns in the long term. Despite some progress, the availability of long maturing funds in DMC domestic markets remains limited. Further, as most infrastructure projects earn in local currency, their capacity to bear foreign exchange risk, particularly over a long time horizon, is very limited. The DMCs' domestic markets also have limited hedging instruments available to manage foreign exchange risks. Some of the major difficulties faced by private infrastructure projects have been due to unexpected variations in foreign exchange rates (e.g., Maynilad Water Services, Philippines). Foreign exchange risk has been a major problem for private infrastructure projects worldwide. Thus, there is a need to continue development of domestic capital markets including long-term contractual saving institutions such as pension funds and insurance companies. Because of the huge demand for infrastructure financing, reliance on foreign capital is inevitable, although currently many DMCs enjoy high domestic savings. Continued

development of derivative products to hedge against the foreign exchange risk is also important. Given the large savings available within the region, the development of regional capital markets to use funds within the region should be promoted.

#### **6. Planning Perspective**

The development of infrastructure also depends on the government's planning approach. As with other goods and services, infrastructure development responds to market demand. However, infrastructure also creates its own demand. Thus, infrastructure development can be taken up in response to demand and as part of a long-term economic vision. The region has several success stories of planned cities, export promotion zones, and industrial areas, where creation of infrastructure led to growth of productive activities and establishments that in turn created demand for infrastructure. In some cases infrastructure has preceded demand, in others, the demand has given impetus to infrastructure development. Examples of both cases are numerous, e.g., the PRC has developed several urban centers, industrial areas, and export processing zones prior to growth of economic activities, and conversely, development of infrastructure after sufficient build up of demand is quite common in the region.

Both approaches have issues. In case of the former, it is the opportunity cost of unutilized capital sunk in the infrastructure until the demand catches up, while in the latter, it is the resulting loss of productivity until adequate infrastructure is built. The PRC experience suggests that development of infrastructure in a planned manner is very effective for promoting growth and supporting poverty reduction. The approach also offers environmental benefits, which can be a key element guiding the design, and the freedom to design a complete set of infrastructure without having to work around preexisting structures. However, some experts believe that more infrastructure has been produced in East Asia than needed, leading to waste that is less likely to occur when infrastructure is built on demand. But building when the demand has already arisen may also result in the loss of productivity in the economy during the hiatus. Further, as infrastructure involves long-term sunk investment, delayed infrastructure development amid rising demand leads to ad-hoc arrangements that may constrain future infrastructure development.

The role of the public and private sectors under these two approaches is another issue to consider. Development of infrastructure prior to growth of

demand for its services can be justified on the basis of high economic return and/or high positive externality but it is likely to be taken up mainly by the public sector. Although the private sector may be mobilized based on anticipated demand, high demand due to currently inadequate infrastructure provides a ready inducement for private sector participation.

## **7. Environmental Impact**

Infrastructure has significant direct and indirect impacts on the environment; many of them are adverse. For example, most physical infrastructure (e.g., roads, rail, irrigation dams, and pipelines, and other land use) can damage the ecology. Generally, infrastructure affects the sustainability of both local and global development. For example, due to the continued heavy reliance on fossil fuel, electricity generation and transport are emitting high levels of greenhouse gases (GHGs) and rapidly growing energy use in this region heightens global climate change. The full benefits and costs of externalities, including the environmental impact, are not accounted for, and comprise a known market failure. Thus, full reliance on the market mechanism is not likely to be an effective strategy to protect the environment. Regulation by the government and explicit financial incentives (tax or nontax) therefore have major roles to play. Because of strong local and global externalities, environmental protection in infrastructure is a strong candidate for regulation and subsidy. For example, traditional technology might be less expensive than new, environmentally friendly technology, but the latter's use should be promoted through subsidies. Further, despite progress, the full environmental impact of projects is not imputed in assessing the economic returns of infrastructure projects. Project selection criteria must therefore be comprehensively reviewed, including the economic analysis, in the region and in ADB. Greater use of strategic environmental assessment must be promoted at national, local, and sector levels. Because of the lumpy investment or sunk costs and long lifetime (often several decades) of infrastructure projects, advance environmental planning is needed. Otherwise, the environmental damage could be locked in and continue to produce adverse impacts for several decades.

## **8. Good Governance**

Infrastructure involves large amounts of funds. Infrastructure projects are among the largest government projects in developing countries. They tend to attract

strong political interest and have substantial scope for corruption through "leakages" and misallocation of resources. Weak governance adds another element of risk and discourages the participation of investors with a reputation for good corporate governance. Thus, support for good governance policies and institutions in infrastructure sectors in developing countries should be a core element of infrastructure sector reforms.

A main area of corruption in infrastructure has been the award of construction contracts. With the changing pattern of delivery of infrastructure, this has expanded to include award of the right to operate infrastructure services, fixing of prices between public and private sector operators (e.g., in a power purchase agreement), and provision of government support such as subsidy or guarantee. Reducing corruption of this nature requires continued development of rule-based systems, strengthened public expenditure management systems, building of capacity, increased transparency in award of contracts, and greater participation of civil society.

The other main area of corruption in infrastructure is day-to-day delivery of services, such as illegal connections, and under-billing for electricity or water use. Such corruption directly impacts the population and results in significant consumer harassment as well as financial losses to the provider. This is very damaging, as it impacts the operational efficiency of the economy the infrastructure is supposed to support. Scarcity and lack of competition and commercialization seem to be at the core of such corruption. These are better addressed by systemic improvements and reforms rather than by policing. For example, prices of infrastructure services may be fixed by the government below the market-determined rate to protect the poor or for political reasons. The gap between the market-based and actual prices becomes a source of corruption, and the gap implies that the consumer can pay more than the price charged.

Competition, private sector participation, and increased availability of the service can address this kind of corruption. Technical and economic reforms in infrastructure pay a strong governance dividend that is not always fully recognized. Use of modern technology (computerized and Internet-based purchase of services) and development of new technologies (lower cost of production) can also help. Reforms and related systemic improvements can take care of corruption in contracting by reducing the role of government, generating competition, and establishing professional independent regulators.

## 9. Inclusive Development

Lack of adequate infrastructure results in market imperfection that leads to noncompetitive pricing of goods and services, which often hurts the poor. Lack of infrastructure also hinders access to services and market participation by the poor and the vulnerable, thereby obstructing the inclusiveness of development. Often the burden falls disproportionately on women (e.g., indoor cooking with biomass has serious health implications, and fetching of water from long distances is time and energy intensive). In addition to well-known economic factors, infrastructure also boosts other factors of growth and labor productivity such as knowledge, enterprise, inventiveness, and a modern work culture, which are particularly important for rural and remote areas. For example, building transport and communications links in rural areas facilitates the flow of modern ideas, fosters free play of the market, and improves interaction with modern urban markets. Most direct poverty reduction or individual beneficiary programs (e.g., providing assets and skills to the poor) are unlikely to be effective without adequate infrastructure to provide inputs at competitive prices and easy access to a competitive market. As most of the poor live in rural areas, building rural infrastructure in Asia and the Pacific is a high priority for poverty reduction and inclusive development. Also important is linking rural areas (e.g., by building feeder roads) to large infrastructure such as highways, power grids, and trunk lines to ensure that the poor share the resulting benefit of economic growth.

## 10. Participation and Inclusion

Participation by the beneficiaries and other stakeholders in identifying, designing, and implementing infrastructure adds value on many counts, particularly if there is insufficient competition. Proper consultation with local stakeholders at early stages can help to ensure that infrastructure projects (1) are designed and implemented to best serve the interest of the community; and (2) enjoy local support, which also facilitates implementation. The benefits of participation are widely recognized and reflected in community-driven development approaches. In local infrastructure projects, the beneficiary and affected communities can also directly contribute to maintenance and management. At provincial and national levels, participation by civil society and consumer groups can provide valuable inputs to the identification and design of larger infrastructure projects. Further, civil society can be a watchdog to ensure good

governance, responsiveness, and accountability of infrastructure service providers. Participation by civil society and consumer groups can contribute to governance and accountability in regulation. Further, nongovernment organizations (NGOs) and other civil society organizations can contribute to monitoring negative externalities or adverse effects of infrastructure development, such as the spread of HIV/AIDS and trafficking of women and children.

## E. Sector-Specific Issues

### 1. Transport

*Roads.* Key sector issues in roads and highways include (1) the need for large sunk investments; (2) public good and natural monopoly features; (3) limited private sector participation; (4) lack of maintenance funding; (5) strong negative externalities (e.g., environment, pollution, safety, and health); and (6) corruption and weak governance.

The public good features of roads limit the scope for excludability and imposition of user fees but are reflected in high economic and social returns on investments. Even if excludability can be introduced, natural monopoly features often mean that the primary avenue for introducing competition in a road is competitive bidding for the right to operate it for fixed periods. Often a road or highway involves large sunk costs, and will not be viable on user fees alone but viability gap financing by the government can make it attractive for the private sector. Full private sector investment may be feasible only in high traffic sections such as selected city roads, bridges, tunnels etc. However, viability gap financing by maintenance contracts with the private sector based on user fees are feasible in several cases.

Problems of private sector participation in roads in the region are compounded by the slow progress in policy, regulatory, and institutional reforms. Capacity building and efficiency enhancement should be an integral part of the reforms. Reducing corruption by establishing more transparent processes and stronger accountability mechanisms is another priority.

Given the huge demand and limited options for financing by the private sector, other options are needed to augment resources for roads. In some countries, road financing from general taxes is supplemented by a dedicated fund for roads supported by special fees or taxes on items related to road use, such as fuel and vehicle registration. These revenues do not go to the general government budget, but are clearly earmarked

for development and maintenance of roads, and this is reflected in greater willingness or less resistance among the road users to paying such taxes and fees. This approach has been implemented successfully in some DMCs, including India. Establishment of a road board that brings a wide range of stakeholders into the decision-making process is likely to increase the political acceptability of such charges.

*Railways.* The main issues related to railways are (1) large initial investments; (2) increasing competition from roads; (3) continuing public ownership, especially of passenger services; and (4) high political sensitivity about passenger tariff. Both fixed infrastructure and mobile rolling stocks are often owned by a single monopoly in railways.

While the fixed components of railways (e.g., long tracks and a signaling system) have natural monopoly features, a degree of competition and/or private sector participation can be introduced in many components by unbundling large monolithic railway systems. The private sector may own or rent rolling stocks, provide services on rented or leased lines, own short lines, and sell passenger services (e.g., catering). Given the strong monopoly features, competitive bidding for the right to provide services for a fixed period also offers a way to promote private sector participation. In terms of infrastructure ownership, the private sector is mainly involved in freight transport.

Other areas of reforms in railways include corporatization of public railway agencies, full cost recovery in passenger tariff, and, in many cases, reduction in the cross-subsidy from freight to passenger traffic. Corporatization can help diversify financing sources (e.g., through market borrowing) to reduce dependence on government budget funding.

Budgetary support to railways is often seen as a means to protect the poor, and should also be seen as a way to protect the environment—railways are among the most environmentally friendly modes of transport. There is a need to compare railway to road transport by imputing the environmental benefits and costs. Often, lobbying by large industry groups (e.g., automobile companies) has hampered the development of railways despite their often being more beneficial than roads for transport.

*Ports and civil aviation.* Large initial investment and continuing public ownership are also among issues facing the ports subsectors. Fixed infrastructure largely remains owned by the public sector, and private sector participation has been limited to provision of loading and unloading and other port services. Generally,

the public authority maintains channels and wharfs and charges rents to private operators of the services. Efficiency in publicly owned ports largely depends on corporatization and professional management. An independent regulator of prices and relationships among and between public and private players is also needed. In small ports, generally all facilities (e.g., channels, wharfs, and loading and unloading services) are provided by the public sector.

Private sector participation is more common in airports because of the good revenue stream from landing charges and shopping and recreation facilities. However, some smaller airports are built entirely from public funding. While they may not be financially viable, they serve well-defined public interest. In general, because consumers of air services are willing to pay for them, political issues do not arise, as is the case with other infrastructure. However, the level of private sector participation in the region's civil aviation is uneven, and the sharing of good practices and replication of success stories should be facilitated in Asia and the Pacific.

*Common issues in transport.* The key common issues in the sector include the suboptimal mix of modes of transport (e.g., roads, railways, ports, and aviation) and inadequate growth of multi-modal transport. This largely reflects the lack of integrated transport planning in most countries. Integrated planning is also important to minimize the environmental costs of transportation, as competition among modes of transportation tends not to lead to the best solutions for the environment.

The transport sector accounts for most of the petroleum and diesel consumption, which is a major source of local air pollution, and emission of GHGs including carbon dioxide, affecting global climate change. Given emerging and proven new clean fuel and technologies (e.g., biofuel, ethanol, hybrid cars, and hydrogen fuel), the transport sector could exploit the carbon market based on the Kyoto Protocol, where several countries agreed to reduce carbon emissions and mobilize substantial additional resources to reduce GHG emission. In the region's rapidly growing urban areas, the feasibility of greater reliance on mass transit systems, light rail, or bus rapid transit should be examined. There is a need to strengthen environmental considerations in identification and economic analysis of transport projects in both government and multilateral financing institutions. Urban planning should be improved and the merits of establishing newly designed urban areas examined.

## 2. Energy

Key current issues in the energy sector include (1) slow progress in reforms; (2) cost recovery inadequate to cover full generation, transmission, and distribution costs; (3) high system losses (e.g., in transmission and distribution of electricity); (4) local and global environmental impacts; (5) inadequate supply to meet rapidly rising energy needs; (6) heavy dependence on fossil fuel; and (7) weak sector governance. Energy conservation must be promoted and energy efficiency addressed from both supply and demand sides, to increase energy availability and reduce per unit cost.

Reflecting technological development, electricity generation increasingly offers greater possibilities for competition. Current technology allows achieving minimum electricity production cost at 100 MW, thus opening the possibility of competition in electricity generation in most large DMCs. Providing access to the full market is also important for competitiveness of the market. For example, in India, the Electricity Act 2003 opened access for independent power producers to sell electricity to consumers of their choice across the country. By improving the competitiveness of the market by expanding its size, this act has catalyzed significant private sector participation in electricity generation in India. In small markets, partial or limited competition can be achieved through competitive bidding for new energy supplies. Private sector participation in electricity generation has been growing in the region, but is still limited in transmission.

A key problem facing private sector participation in electricity is inadequate recovery of the total cost of power delivery, including generation, transmission, and distribution. There is significant scope for reducing system losses (including transmission and distribution losses) through upgrading technology and reducing theft. Inadequate recovery when services are underpriced also reflects poor collection. Losses arise from both operational (e.g., theft and improper metering) and managerial (financial management and billing) weaknesses. The scope and sequencing of sector reform should focus on the adequacy of power tariff and on distributional efficiency. Increasing efficiency and private sector participation in distribution should be a part of all reform efforts from the outset.

Because numerous players are involved and tariffs are politically sensitive, the private sector generally considers investment in the power sector to be risky. Power purchase agreements have often had to be renegotiated in the region, reflecting the many unknown factors. Perceived corruption heightens the

degree of perceived risk. Development of a credible rule-based system with an independent regulation and dispute resolution mechanism is critical to promote private sector investment in this sector.

Energy supply contributes significantly to improving the quality of peoples' lives. Because energy is an important input for achieving the MDGs, it is increasingly being referred to as a "missing MDG." Access to modern energy services (electricity, gas, liquid fuels, and equivalent alternatives) is vital for poverty reduction and human development. Globally, the number of poor people relying exclusively on biomass fuels for meeting basic needs is about 2.4 billion, and this is not projected to decline for the next 2.5 decades. The number of people in Asia and the Pacific without access to grid electricity is also not projected to change much during this period, from the current level of about 1 billion. This major challenge calls for an emphasis on rural electrification. Alternative energy supplies (e.g., renewables) and alternative delivery mechanisms (e.g., dispersed off-grid generation) are needed to improve the access of the poor to modern energy, particularly in rural areas. The dispersed renewable technologies (e.g., solar photovoltaic home systems, biogas digesters, and micro wind turbines) are rapidly growing and their costs are decreasing but they continue to cost more than conventional electricity. Support is needed for innovation of new technologies and to allow them to move into production. Such support is especially important during initial periods to promote mass production and achieve economies of scale. Small-scale off-grid generation based on renewable energy and alternative fuels below certain capacity (e.g., 5 MW), should be delicensed and deregulated and rules for self-generation and community-level distribution networks should be greatly simplified. The need to supply all people, based on their ability to pay, needs consideration in supply and pricing.

The environmental impact of conventional energy and traditional fuels at local and global levels is a major issue. The global consensus is increasing about the need to contain GHG emissions to contain global warming and climate change. Carbon dioxide emissions from coal, the major source of electricity generation in the region, is of particular global concern. Carbon financing based on the Kyoto Protocol should be used to finance new technologies. As clean energy technology is costlier than traditional modes, development of the carbon market to mobilize additional resources is a key priority for the region. New technologies include integrated gasification combined cycle plants, super critical

boilers (slightly costlier but 6–10% more efficient than traditional pulverized coal technology), and fluidized bed combustion (also slightly more expensive). The recognition of benefits of regional cooperation in the energy sector in Asia and the Pacific is also increasing. For example, regional cooperation or trade in electricity and natural gas supply can benefit both surplus and deficit countries.

### **3. Water Supply, Sanitation, and Waste Management**

Despite some differences between water supply, sanitation, and waste (WSSW) management subsectors, they have many common economic and technical features. This subsection focuses on water supply, but much of the features discussed also apply to sanitation and waste management. Key current issues related to the development and operation of water supply infrastructure are (1) generally low operational parameters (e.g., high levels of nonrevenue water); (2) technical and economic features (strong natural monopoly features); (3) a predominance of public ownership; (4) low willingness to pay because users are accustomed to it being a free good and/or easy availability of alternative supply sources (e.g., village pond); (5) political unwillingness to raise prices to recover the full cost; and (6) poor metering, billing arrears, and corruption. Generally, financial viability is a key problem in the WSSW management projects. However, because strong positive environmental and health externalities are associated with this sector, services continue to be predominantly provided by the public sector.

Despite limited success stories, experience with private sector participation in WSSW management over the last two decades has not been encouraging. Private sector interest continues to be low. This situation is likely to continue in the near future, although some good projects have recently started in the PRC. Sanitation and waste management with greater degree of positive externality than water supply, are still seen as public goods, and are likely to stay predominantly in the public sector longer than water supply. However, willingness to pay for piped water supply is increasing somewhat and water treatment plants are feasible for private sector investment, as payment comes from the utility or the government rather than the consumers directly.

Thus, reforms in these subsectors should target increasing efficiency through corporatization and commercialization of public agencies, and low risk private sector participation, such as management

contracts and leasing. A phased increase in prices is needed to reduce the pressure on fiscal resources. Some financing, albeit limited, could also be mobilized through private sector participation. Box 2 presents good examples that can be replicated in the region. However, some major private sector participants have been leaving the Asian water supply market partly due to the unpredictability of the government systems. Regulators independent of the government are needed even if most operators are in the public sector. Independent regulation would help build discipline, experience, capacity, and an established track record that could help initiate or increase private sector participation.

Subsidies and under pricing of services in this sector reflect government wishes to protect the interest of the poor, but in reality the rich, who are better connected to the piped system, benefit more than the poor. Thus, subsidies should be well targeted through more innovative methods such as output-based pricing. As past practice and continuing expectation is a main deterrent to price increases, a phased or gradual reduction of subsidy to full cost recovery pricing over a reasonable period (medium to long term) may be practical.

As many institutions are involved, development of the water sector has often been fragmented, which calls for close intersectoral coordination. A strong neutral water sector apex body is needed to facilitate coordination and oversee the required policy and reform process.

### **4. Telecommunications**

Due to both technical and economic features, telecommunications are amenable to competition and private sector participation. This sector is easily unbundled, metering and billing is technically easy, and the sunk cost is low. Therefore, telecommunications has been able to attract significant private participation and funding. Pricing in the sector has been less politically sensitive than in other sectors and technology has reduced costs, which has made the task easier. The development of regulation has advanced further than other infrastructure sectors. The key issue is uneven development across the region. The many success stories should be replicated.

### **5. Irrigation**

Large-scale irrigation and drainage services in Asia and the Pacific have been highly subsidized and continue to be almost entirely in the public sector. This partly reflects the high initial investment required for new

## Box 2: Successful Water Supply Projects

### Public Sector

- Cambodia Phnom Penh Water Supply and Sanitation Authority is a public utility that has gradually transformed itself into a financially and operationally autonomous entity. The authority is now regarded as one of the most efficient public water utilities in the world, with only 8% nonrevenue water (down from 72% in 1993) and a collection efficiency of 99%.

### Public-Private Partnership

- The east zone concession in Metro Manila is operated by Manila Water Company. It has 29.9% nonrevenue water (down from 63% in 1997) and 91% of its customers enjoying 24-hour supply.
- Malé Water Supply in Maldives, a joint venture arrangement, demonstrates how a water scarce island can manage to deliver water 24 hours daily.
- Chengdu Water Supply BOT has demonstrated that a build-operate-transfer (BOT) structure can be implemented at the municipal level and funded without central government guarantee. The success has provided important signals for private investment in infrastructure projects in the People's Republic of China in general and has served as a model for several other projects in the country.

systems. Other key issues include (1) low water use efficiency (30–40% or lower); (2) low productivity of water in agriculture; (3) poor maintenance; (4) lack of coherent policy for water rights, water pricing, and water control; (5) limited private sector participation; and (6) declining investment. The willingness to pay and cost recovery in irrigation and drainage services are low. Often the price paid for irrigation water is

not even enough to recover the full operations and maintenance cost. Even where farmers participate in water users associations, most of them depend largely on the government for operation and maintenance and for major repair and rehabilitation. Damage to the environment (e.g., land degradation) due to poor irrigation and drainage management is another important issue.