

# Notes

## Executive Summary

1. More precisely, the study's infrastructure coverage focuses on water supply and sanitation, information and communications technology, electricity and gas, and all forms of transportation. The study addresses upstream oil and gas or water resources management only peripherally. It does not specifically cover housing, education, health, or other social infrastructure.
2. For instance, when infrastructure encourages sustainable agricultural resources, or creates alternatives to exploiting forest resources, or provides water and sanitation.
3. The term fiscal space covers all forms of fiscal support, including guarantees and other contingent liabilities, as well as direct expenditures.

## Chapter 1

1. Since 1999, the population of the developing countries of East Asia has risen by 4 percent to about 1.85 billion, and the number of people living on less than \$2 a day has fallen from 890 million to 636 million, that is, from about one person in two to one person in three. In China, which accounts for 70 percent of the region's population, the headcount of those living on less than \$2 a day is down to an estimated 32 percent of the population of 2004, from 50 percent in 1999 (World Bank 2004d).
2. From 4 to 12 percent, excluding oil exports.
3. This is almost as much as the share of global trade represented by trade among North American economies at the time the North American Free Trade Agreement first went into force in 1994.
4. As a measure of the emerging dynamism of China in the trade equation, China's share of the GDP of East Asian developing countries went from one-third in 1996 to one-half only six years later.
5. See <http://rru.worldbank.org/investmentclimate/>. This is the proportion of firms saying that any of electricity, telecommunications, or transportation are "major" or "severe" obstacles.
6. A perceptions survey of Japanese investors in developing East Asia yielded some interesting findings. For example, Japanese vehicle manufacturers operating in Thailand report that Bangkok traffic congestion has a significant cost-raising impact on the levels of stocks of parts they need to hold. In Vietnam, which has substantial Japanese investment

attracted by high labor productivity and rapid economic growth, 32.9 percent of Japanese firms cite poor infrastructure as their major obstacle. See Nomura Research Institute, Ltd. (2004). See also JBIC (2004).

7. This contrasts with capital-per-worker growth in China of about 10 percent a year since 1990.
8. Measured by the \$2 per day poverty line.
9. To give one example of the magnitude of the poverty risk, Spencer (2004) quotes a panel data study from Sichuan which found over a five-year period that, while 30 percent of households fell below the poverty line in at least one year, only 2.4 percent were below the line in all five years, and the average number below the line was only 11–14 percent. See Jones (2004a).
10. Urban areas spreading to envelope rural areas is a close second as a cause of urban growth (World Bank 2004c).
11. The share of agriculture in East Asian GDP has fallen from 28 percent to 13 percent since 1980, while the share of industry and services has risen from 72 percent to 87 percent over the same period (World Bank 2004c).
12. See UTCE/ALMEC (2004a) for a discussion of this issue.
13. The GMS includes Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and China's Yunnan Province.
14. See, for instance, Rufo and Rufo 2004; Van Hanh, Van Song, Van Duc, and Van Duc 2002; and Xianqiang and Xiurui 2001 for analyses that seek to quantify environmental impacts arising in recent infrastructure undertakings in East Asia. See Uzawa (1994) for a discussion of the environmental impacts arising from Japan's construction of its extensive highway network and several thermal power plants in the 1960s and 1970s.
15. In contrast to the Latin American experience, East Asian private participation in infrastructure tended to be confined to individual greenfield projects with little sector restructuring, rather than privatization of existing assets in the context of sectorwide reforms designed to enhance overall efficiency.
16. An analysis carried out by the World Bank (Yepes 2004) estimates these needs for certain sectors only (see Annex 1 to this Chapter for a methodological explanation). This analysis extrapolates past trends and does not incorporate any normative concept of needs such as the MDGs. It also utilizes efficiency prices (that is, it assumes costs are minimized), so actual expenditures may be significantly higher than these estimates.
17. One exception to this general point is the grant element in official loans and grants, which does provide additional resources. Conceptually, this

can be seen as foreign taxpayers supplementing the resources available from domestic taxpayers, rather than being considered to be financing as such.

18. Development of local capital markets are also seen as a means of mitigating foreign currency risk. If financing is made available in local currency for assets that earn revenues in local currency (which is often the case for infrastructure), the resulting currency match reduces risk. It should be noted that this will not eliminate all currency risk, because domestic currency interest rates will generally reflect expected exchange rate movements—unless capital is completely immobile. It is also worth noting that derivatives markets may provide an alternative hedge against currency risk, although their development tends to lag behind the development of local capital markets.
19. On the basis that up to 80 percent of the costs of delivering water are fixed costs. See Castalia (2004c) for more details.
20. There is a closely related issue of what happens to fiscal space for infrastructure in countries that have been heavily using quasi-fiscal space but decide to reform. For example, if China continues with financial sector reform, and financial institutions consequently cut back on lending for infrastructure projects that are not commercially viable, but have attractive economic rates of return, will the government budget step in to fund those projects?
21. World Bank, Private Participation in Infrastructure (PPI) Database. Note that the PPI Database records total investment in infrastructure projects with private participation, not private investment alone. Investment commitments include expenditures on facility expansion, divestiture revenues, and license or canon fees. For all infrastructure projects with private participation in developing countries, the private sector accounted, on average, for 85 percent to 90 percent of total investment.
22. These are measures of investment in physical infrastructure (for example, roads) rather than in infrastructure service assets (for example, trucks). There are of course important subsectoral differences: private investment is most significant in telecommunications, second comes electricity, third is transport, and last comes water and sanitation.
23. Significantly, private investment in infrastructure in the industrial world seems to have recovered from the 1997 crisis quite quickly. For example, project finance lending (one proxy measure for infrastructure investment trends) reached an all-time high in 2000, because the growth in such lending to industrial countries (which climbed steadily from 1997 onwards) more than offset the post-1997 decline in lending to developing countries (see Sorge 2004).
24. This is one of the principal findings of the *East Asia and Pacific Private Investors in Infrastructure Perception Survey* (2004). The survey

included 50 interviews with infrastructure investors (all operators) active in East Asia (the firms were split roughly 50/50 between those from East Asia and those from elsewhere. This paper is available on <http://www.worldbank.org/eapinfrastructure>.

25. Here we look at the role of donors in the context of East Asia's funding story. We consider this role more broadly in Chapter 5.
26. ODA includes net disbursements of concessional loans and grants from official sources, as defined by the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD). It excludes nonconcessional loans, export credits, and guarantees. No reliable breakdown by sector, to identify the share spent on infrastructure, is available.
27. To the extent that there is a concessional element in donor financing, that concessional element will be an addition to a country's domestic resources.
28. See Clements, Gupta, Pivovarsky, and Tiongson (2004).
29. That is, the data exclude urban roads, unpaved roads, secondary tertiary paved roads, mass transit, ports, airports, gas grids, bridges, and waterways. The analysis therefore excludes substantial infrastructure expenditures.
30. Countries included in the model are China, Indonesia, Lao PDR, Malaysia, Mongolia, Papua New Guinea, the Philippines, and Thailand, which collectively represent 98 percent of the total GDP of the 21 developing countries in the East Asia and Pacific region.
31. For electricity, roads, and railways, we use 2 percent; water and sanitation 3 percent; and telecommunications 8 percent.
32. Countries included are Cambodia, Fiji, Kiribati, the Marshall Islands, Micronesia, Myanmar, Palau, Samoa, the Solomon Islands, Timor-Leste, Tonga, and Vanuatu.

## Chapter 2

1. Technological change can have a profound impact on infrastructure provision: It can change the longevity of assets, affect the potential for competition and the challenge of regulation, and alter the balance between incrementalist approaches and lumpy ones. Telecommunications and some parts of transport, for example, have seen some radical technological development in recent decades (for instance, cellular telephony or containerization). Energy has seen some important changes (such as the introduction of combined-cycle gas turbines and advances in gas liquefaction), and may be on the verge of breakthroughs in decentralized and renewable solutions. In water and sanitation, technological change has been more modest.
2. See, for example, Prud'homme (2004), DfID (2002), or Kessides (1996).

3. See Briceno, Estache, and Shafik (2004) for a recent literature survey.
4. At one end of the spectrum of wealth and power, this tension between general and local interests demands safeguarding highly vulnerable groups against dispossession and exploitation. At the other end, it can involve highly advantaged and powerful groups engaging in the phenomenon of NIMBYism (not in my backyard). Infrastructure development runs along a fault line of general versus local interests probably more often than any other sector and, hence, can become highly politicized.
5. This discussion draws on Carruthers, Bajpai, and Hummels (2003), and Fujita and Hisa (2004).
6. Evenett and Venables (2001) show that 40 percent of trade growth in East Asia comes from offering new products and finding new trade partners.
7. To cite just one example, 63 percent of the cost of transporting goods from Chongqing to the west coast of the United States is incurred before arriving at the Chinese port of export (Carruthers, Bajpai, and Hummels 2003).
8. For example, more than 90 percent of the FDI in export-oriented industries in China has gone to the four main coastal provinces. Similarly, the multiplier effect of the textile export boom in Cambodia has been limited mainly to areas easily accessible to the Sihanoukville port. On congestion, a study of Bangkok estimated that moving port-related activities away from the downtown area would result in a 10 percent reduction in peak-hour trips (UNESCAP 2000).
9. Guasch and Kogan (2001) found that inventory holdings in developing countries are two to three times the U.S. level, and estimated that merely halving them would lower production costs by an average of 20 percent, which would bring more producers to market. Uncertainty in delivery schedules may be caused by underdeveloped or poorly maintained road and rail networks, congestion in urban areas where economic activity and population growth have outpaced infrastructure, onerous border procedures, poor security, and unreliable information flows (particularly where information and communications infrastructure does not allow sophisticated electronic data interchange).
10. In many industrial East Asian countries, barely 10 percent of trade-related transport services are contracted to 3PL providers, in contrast to almost one-third of such services in OECD industrial countries (Carruthers, Bajpai, and Hummels 2003).
11. There are various ongoing regional and subregional initiatives in this area, including those under the auspices of the Association of Southeast Asian Nations (ASEAN), Asia-Pacific Economic Cooperation (APEC), the Mekong River Commission, the GMS, and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP).

12. This could include protecting rights-of-way for future road or rail development, land banking, and ensuring that land is available for services that require easy access to ports, airports, and so on.
13. The strong links between economic growth and poverty reduction in Vietnam can be attributed, in part, to the peculiar nature of poverty in the country. The poor are not a static group: A high share of the population is clustered around the poverty line and the poverty status of households fluctuates over time (with the exception of ethnic minorities). While this suggests a high vulnerability to shocks, it also implies that small increases in per capita income may be sufficient to lift the poor out of poverty.
14. The elasticity of poverty reduction to economic growth indicates the proportionate reduction in poverty (in percentage points) for every percentage point of GDP growth. See Larsen, Lan, and Rama (2004).
15. Of course there has been far more to Vietnam's success than infrastructure and investment alone. Rural and agricultural strategies, in particular, have played a significant role in supporting both growth and poverty reduction.
16. These impacts have been the subject of a joint government-donor review of infrastructure in Vietnam, as part of Vietnam's Comprehensive Poverty Reduction and Growth Strategy. Projects examined as part of the review included improvements to the National Highway No. 1, the My Thuan bridge and the North-South 500 kV transmission line, in addition to the Ha Noi-Hai Phong northern transport corridor. See GRIPS Development Forum (2003) for details.
17. The authors found that for every billion dong spent on agricultural research, 339 poor people would be lifted above the poverty line. Road investment yields the second largest return, with every billion dong spent on roads lifting 132 poor people above the poverty line. For every billion dong spent on education, 76 poor people were lifted above the poverty line.
18. Between 1998 and 2002, the rate of poverty reduction in rural areas was only 5.4 percentage points against the urban figure of 7.1 percentage points. Poverty among ethnic minorities has decreased by only 2 percent (World Bank 2003b). More than 50 percent of the poor live in three regions (Northern Uplands, North Central Coast, and Central Highlands), which account for only 34 percent of the total population.
19. Of course there has been far more to Vietnam's success than infrastructure and investment alone. Rural and agricultural strategies, in particular, have played a significant role in supporting both growth and poverty reduction.

### Chapter 3

1. Mody (1997) gives a detailed account of infrastructure strategies in these six countries.
2. See Kuninori (1997) for a detailed analysis of how Japan approached infrastructure finance.
3. Which is not to say, of course, that at times the short-term fiscal horizon is not more important than the long term. Governments with poor fiscal track records, or recovering from financial crisis, would often do well to concentrate on short-term liquidity.
4. For further analyses of these points see IMF (2004a), Brixi and Irwin (2004), and Easterly and Serven (2003).
5. This section is based on Medalla (2004), except where otherwise indicated.
6. According to the World Bank's 2003 Investment Survey, 33.4 percent of the firms interviewed for the country stated that electricity posed a major or severe threat to business operation and growth; 18.3 percent reported the same of transport (<http://rru.worldbank.org/InvestmentClimate/>).
7. In 2003, for instance, the financing gap (including loan repayment and capital expenditures, before external financing) of the state-owned generation and transmission company, NPC, increased sharply to P86 billion (\$1.6 billion) from P19 billion (\$500 million) in 1999, contributing in turn to the country's ballooning public sector deficits.
8. Less than 50 percent of the monitored national road network, for instance, is considered to be in good condition as measured by the International Roughness Index.
9. Recent government data show nationwide averages of access to safe drinking water deteriorated from 81.4 percent in 1999 to 80 percent in 2002, while the percentages for the poorest segment of the population decreased from 71.5 percent to 70.2 percent for the same time period.
10. For instance, following concessioning of local telecommunication services in 1995, telephone mainlines per employee increased from 82 to 181 over a period of six years.
11. Indonesia has more than 400 local governments in *kabupatens* and *kotas* as compared with only 33 provincial governments.
12. Indonesia's fuel subsidies are a good example of the lack of mainstreaming of environmental and social considerations. Although fuel subsidies make good populist politics, they are very poorly targeted (so reduce fiscal space for programs that genuinely help the poor) and exacerbate urban congestion and pollution.
13. This section is based on Liu (2004), except where otherwise indicated.

14. Although by way of context, the average Chinese province has a population about twice that of the whole of Malaysia. China has roughly the same number of provinces as Indonesia, but it has more than five times the total population. Decentralization in China cannot easily be compared with decentralization in smaller countries.
15. This section is based on Webster and Theeratham (2004), except where otherwise indicated.
16. For example, the rise of China as “factory of the world” is causing Thailand to focus more on the high-level service sector. This requires dense, high-transaction business environments with easy accessibility. The desire to create such environments has meant an increased focus on mass transit in the urban core (see Spotlight 1 later in this chapter). In peri-urban areas, manufacturing is becoming increasingly centered in dominant clusters of integrated supply chains (for example, the automotive sector) as a result of competition from China, and infrastructure in peri-urban areas has been reoriented accordingly.
17. Directed lending and government guarantees on loans or bonds have played a significant role in Thai infrastructure financing.
18. MRT (Mass Rapid Transit) is used as shorthand for urban rail systems that carry a mass ridership rapidly. They include metros and Light Rail Transit (LRT) systems that are segregated from other road traffic.
19. See Halcrow Group Ltd. (2004) for a detailed analysis of the tale of three cities.
20. Kuala Lumpur’s current population is about 1.3 million people.
21. KL STAR and KL PUTRA were subsequently taken over by the state in 2002.
22. If measured instead from specific project concept to operations the time lapse ranges from 5 years (KL PUTRA) to 13 (MRT2).
23. Hong Kong (China) is an arguable exception. But even in Hong Kong (China), whose high density and prosperous population creates probably the most favorable MRT environment possible anywhere, the MRT system is in effect cross-subsidized from property value appreciation.
24. Some projects were financed in part by state-owned financial institutions, so there may have been some hidden subsidies.
25. All the projects in question had highly overoptimistic projections of ridership—a common bias in MRT planning.

#### Chapter 4

1. This is not to say that accountability and risk management only operate at this level. For instance, society’s leaders are also held accountable (or fail to be held accountable) for the practical relevance of their strategic

vision through their country's national political institutions. Their strategic decisions are deeply determined by avoidance of risk and desire for reward.

2. Sen (1999).
3. We saw earlier how disability advocacy groups got involved in the design of the Bangkok subway during the planning stage, which substantially increased the feasibility of incorporating elevators and barrier-free access (see Chapter 2, Box 2.7).
4. Competitive markets also tend to hold consumers accountable. Where service providers are monopolists they are sometimes obliged to serve even those customers with bad payments records—in essence, subsidizing them out of monopoly profits. In competitive markets, it is harder to impose such an obligation to serve without explicit compensation. Once compensation is explicit, it is more likely to be targeted to specific types of customer, and other customers face a clearer obligation to pay if they are to continue to receive service.
5. Gordon-Walker and Marr (2002). See also Tynan and Kingdom (2005).
6. The system of “inset appointments” in England and Wales allows large users to choose an alternative licensed supplier. Inset appointments allow one company to replace another or the statutory service provider for a specified geographic area. For a comprehensive analysis of level of competition in the water sector in European countries, see, for example, Gordon-Walker and Marr (2002).
7. See Kessides (2004).
8. The IPP/single-buyer model obviously allows for competition for the market (through a bidding process for the IPP concession), although it precludes competition in the market. However, under this model, the government generally decides significant aspects of the technical specifications in an IPP bidding process, often including the type of fuel, which to some extent limits the impact of competition for the market.
9. Usually, the sector structure before the introduction of the IPPs was a vertically integrated state-owned monopoly. The single buyer frequently retains some generation capacity as well.
10. Electricity grids need a central operator to coordinate system balancing, reliability, and ancillary services, and operating cultures cannot easily change overnight from the one prevailing in a vertically integrated utility. Unbundling those operational functions from the control over generation can therefore take time. IPPs can be a transitional step.
11. It is worth noting that single buyers create their own significant risks for generators. If a generator has no choice but to sell power to the single buyer, it faces a risk of contract abrogation with no escape to other

purchasers. This helps explain the length and broad scope of take-or-pay PPAs involving single buyers, as well as the sometimes high prices under such contracts. Unfortunately, long-term PPAs, covering a substantial portion of generated power in a system, make it difficult to move later to a competitive market model without expensive compensation of preexisting contracts.

12. See Kessides (2004) and Hunt and Shuttleworth (1996) for a comprehensive discussion of the merits and demerits of the single-buyer model.
13. Of course, this can also involve regulators holding individual consumers accountable, so that their actions don't negatively affect other consumers (for example, allowing service providers to take action against nonpaying customers so that paying customers don't have to cross-subsidize them).
14. The basic analysis of this section applies whether investors are public or private. However, holding publicly-owned infrastructure service providers accountable for performance is generally more difficult than doing so for private providers, whether through regulation, competition, or other means.
15. See, for example, Kessides (2004).
16. Subsidies paid per connection, or capital grants made to service providers, are examples of one-time payments. Connection subsidies are one type of performance-based subsidy, and are an important example of measuring performance by clearly defined outputs. The funding by donors of subsidies contingent on delivery of outputs has recently become known as output-based aid (OBA), although the term is also used to cover other performance-based subsidies (including those not funded by aid).
17. There are other ways to minimize subsidy risk, including disbursing subsidies into escrow accounts or trust funds, contracts with private providers, or involving an external donor such as through an OBA scheme.
18. See Brix and Irwin (2004) for a detailed discussion of fiscal institutions to manage infrastructure risk.
19. Even without efficiency gains, solvency could potentially be improved by the transaction if the government's illiquidity would have prevented a pure public investment from being implemented, but private financing overcomes that constraint (as long as the project rate of return is sufficient to exceed the cost of private capital).
20. For example, Guasch (2004) found from a sample of more than 1,000 infrastructure concessions in Latin America and the Caribbean during 1985–2000 that renegotiations occurred in 30 percent of them (this increases to 74 percent for water and sanitation concessions alone). See also Harris, Hodges, Schur, and Shukla (2003).

21. See Kessides (2004) or Coelli, Estache, Perelman, and Trujillo (2003) for surveys of the empirical literature. The analysis is complicated by the variety of risk-sharing arrangements in infrastructure; hence, it is difficult to define “private” and “public” on a comparable basis, and also in the interdependence of performance of different entities in a given network (for example, if private electricity generators rely on a publicly owned transmission company it would sometimes be difficult to assess their performance independently).
22. This case study draws on Maguire and Malinovitch (2004).
23. In all models, however, the government retains responsibility for the delivery of defined core services, such as nurses in hospital and officers in prisons.
24. The survey questionnaire has been prepared for the second meeting of the EAP Forum of Infrastructure Regulators, which was held in Manila on April 5–7, 2004. The survey questionnaire covered 45 regulatory bodies from 21 countries (Australia, Cambodia, China, Fiji Islands, Hong Kong (China), Indonesia, Kiribati, Korea, Lao PDR, Malaysia, Micronesia, Mongolia, Papua New Guinea, the Philippines, Samoa, Solomon Islands, Singapore, Thailand, Tonga, Vanuatu, and Vietnam) and from all infrastructure industries (15 energy regulators, 14 regulators in water and sanitation, 10 regulators in telecom, 1 transport regulator, and 8 multisector regulators).
25. A few significant exceptions are to be acknowledged, namely the Consumer Forum in Malaysia and the Yayasan Lembaga Konsumen Indonesia (YLKI) in Indonesia.
26. Consumer International 2004.
27. Middle-income customers advocating against tariff increases may indeed jeopardize the possibility to expand access.

## Chapter 5

1. The term fiscal space covers all forms of fiscal support, including guarantees and other contingent liabilities, as well as direct expenditures.
2. Note that the Corruption Perceptions Index is a general index, and is not infrastructure specific.
3. Taking into account the resource needs of ports, airports, bridges, secondary roads, urban transport, and gas grids, as well as strategic decision to invest in infrastructure ahead of demand, the level of required expenditure may well be higher than 3.6 percent of GDP.



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