

**PRIVATE SECTOR PARTICIPATION
AND INFRASTRUCTURE INVESTMENT
IN ASIA:**

The Impact of the Currency Crisis

Revised Version

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1. EXECUTIVE SUMMARY

This paper reviews the East Asia currency crisis and its impact on infrastructure investment in the following steps:

- *First, the changing roles in infrastructure for both government and the private sector are described, noting the duality of an increased role for government in structuring and regulatory roles, in order that privatization and unbundling of assets is competitive and customer focused.*
- *Second, the depth of the crisis is discussed, including the heavy currency exposure due to many BOTs and IPPs having been negotiated outside market disciplines, creating another mismatch of capacity and demand, this time with excess supply.*
- *Comment is made on the quantitative projections which the Asian Development Bank and the World Bank produced in the context of the reassessment of infrastructure needs in Asia over the decade 1996-2005.*
- *Each country and sector is assessed on evidence regarding the nature of the impact on infrastructure projects – the “micro” view accumulated from project finance and other sources. Cancellations and continuations are noted, as well as the factors likely to affect future outcomes.*
- *Projections on infrastructure investment demands 1996 to 2005 are re-modeled, noting the impact of:*
 - *Correcting for actual outcomes in 1995-7 (i.e. the Peoples’ Republic of China (PRC) performed better than projected).*
 - *Inclusion of consensus projections for 1998-2005.*
 - *Adjustment for efficiencies in capital expenditure due to a phased shift to private sector financing and management.*
 - *Different sectors and different countries.*
- *The sectoral implications of a shift to “best practice” are discussed along the lines emerging from the work of the Asian Development Bank for APEC in this regard.*
- *Finally, an overview is provided of the financing picture and policy implications that emerge from the analysis.*

1.1. The New Approach to Infrastructure in East Asia

1. Perspectives on infrastructure changed markedly in the 1990s. It became apparent that investment requirements for infrastructure in East Asia were on a scale that dwarfed earlier projections and experience. The vast Chinese and other East Asian “tiger” economies were growing rapidly, demanding massive investments in power, roads and communications. In most East Asian economies there was also a sense that development was being hindered by bottlenecks in power (e.g. the Philippines), transport (e.g. Thailand), water (most of East Asia), and communications infrastructure in general. Government infrastructure spending, international aid and official sector lending could not be on a scale sufficient to meet requirements, which were initially estimated by the Asian Development Bank to be in the US\$1,000 billion plus bracket for the 1990s and independently by the World Bank to be of the order of US\$1,500 billion in the decade from 1995 (numbers that are independently re-assessed below).
2. There had also been a shift in evidence as to the comparative advantages of government and the private sector in performing the component roles that go into the provision of quality infrastructure services. Increasingly, an expanded regulatory and structuring role was seen for government, but with investment, construction, financing and management seen as best opened to competitive private tender. Risks should be assigned to the parties best able to mitigate them, and here this meant a greatly expanded role for the private sector. Additionally, there was recognition that while many private sector investments of the Build-Operate-Transfer (BOT) kind were now being completed, and indeed the expression “BOT” was becoming a shorthand for privatization, the assignment of risks in many of these BOTs left much to be desired. Government guarantees of bulk take-or-pay contracts indexed to exchange rates, meant that utilities and government currency exposure was major – as the current crisis has shown.
3. The resulting new approach, while often including the BOT model as a starting point, was one that demanded more, not less, acceptance of risk by the private sector. But this would only be possible if governance, including transparency, enforcement of contracts and commercial tariff structures became a reality. *Again, the duality of the challenge is highlighted; the privatization model does not mean a retreat by government – but an upgrade of its structuring and monitoring roles.* This “duality” is a key to understanding the point that without greatly improved governance in East Asian countries, the shift to increased private sector participation (PSP) could just mean monopoly powers were shifted to the well connected in the private sector. What is more, without improved governance, private sector participation would eventually flounder and the projections fail to materialize, as risks became unacceptable.
4. The new focus was to be very much on the rules of the game that could create the environment for sustainable private investment. Goals would include improved efficiency and a shift from government to private providers. There was mounting evidence that much infrastructure investment was poorly

maintained – there was often no budget or loan provisions for maintenance, and tariffs were typically politically constrained to levels unable to sustain both operations and maintenance. With increased private sector participation in distribution, the losses of water or electricity would tend to be minimized as they represented losses of revenue required to sustain investments. Bankers and investors would insist on performance that in many cases government enterprises seemed unable to deliver. However, the vast amount of private sector participation in utilities to date has been via bulk contracts and not investments in the distribution systems. This shows that the integration of private sector participation into the system has a way to go in terms of implementation.

1.2. The Numbers

5. The Asian Development Bank in the 1990s produced projections of massive infrastructure investment over the coming decades. In an initial projection of infrastructure investment, the estimate of US\$1 trillion infrastructure demand during the 1990s was generated. The ADB's "*Emerging Asia: Changes and Challenges*", April 1997 wrote of "Asia's accumulated infrastructure demands during the next 30 years are likely to exceed US\$10 trillion" (p42). The World Bank released studies with US\$1.2 - US\$1.5 trillion projections of infrastructure demand from 1995 - 2004 (*Infrastructure Development in East Asia and the Pacific - Towards a New Public-Private Partnership, 1995*).
6. These and many other projections served usefully to focus on the level and structure of the huge demands of a growing and increasingly prosperous and urbanized Asia. The projections were part of a major shift of focus towards best practice forms of private sector participation in infrastructure - crucially motivated by efficiency considerations, but also reflecting the view that public sector financing of this scale of infrastructure requirements was infeasible. The earlier World Development Report of the World Bank in 1994, *Infrastructure for Development*, represented a comprehensive argument for the new approach, which focused on government as regulator and the private sector as financier, manager and investor in infrastructure service provision.
7. The East Asian currency crisis from July 1997 has caused some dramatic revisions both to economic growth projections and to the investment program of the public and private sectors over the projection period (to 2005). While the Annex sets out detailed projections to 2005, it is worth summarizing a small sample of the basic findings.
8. The attached "macro" projections, adjusted to allow for both the phase-in of private sector market disciplines and reduced growth in East Asia, but embodying recent high growth outcomes in China, are 24% below the earlier (adjusted) base line projections. The details and assumptions regarding these projections are summarized below and set out in the Annex.
9. A summary of the projected cumulative demand for infrastructure for the period 1996 – 2005 is set out in Table 1 and Table 2. Table 1 presents the

amount of projected cumulative demand for infrastructure, using current (post-crisis) GDP growth forecasts. Table 2 presents projected cumulative demand for infrastructure, using current (post-crisis) GDP growth forecasts, which are assumed to be lower by a uniform 2% each year. The *base case* forecast of US\$1.78 trillion, presented in Table 1 and Table 2, represents the amount of infrastructure spending projected on the assumed basis of “no crisis”. Case I assumes no special efficiency gains in each of the sectors and countries under investigation (referred to as “no transition” model); whereas Case 2 allows for a 25% increase in efficiency in each of the sectors and the countries considered. Case 3 differs from Case 2 in that it allows for sector and country-specific efficiency gains (Cases 2 and 3 are referred to as “transition” models), although as it turns out this sensible refinement had little aggregate impact on the summary totals.

10. An important factor in making projections for this region is that the PRC accounts for roughly one half of the infrastructure spending for the region. In these projections, the PRC is not assumed to slow in growth to 2005.¹ The PRC assumption significantly tempers the forecast reduction in infrastructure demand for the region due to reduced growth, which would need to be revised again should the PRC’s economic growth slow down to a marked extent. (The details in the Annex indicate that about half the projected infrastructure investment growth is due to the PRC).

¹ At an August, 1998, conference on Chinese economic growth at the Australian National University, there was an assessment of Chinese growth prospects by Ligang Song of the ANU. In brief, the paper is positive on Chinese growth prospects, particularly if major reforms continue in relation to state enterprises and the financial system: “*The growth issues in China have to be approached, understood and dealt with in the context of ongoing economic reform. Whether the growth rate is 8 or 7.5 or 7 per cent is not that important in this context. What matters most is the ‘quality’ of economic growth, namely whether such growth has been accompanied with an improvement in the economic structure, efficiency and productivity. It remains a challenge for the government to engineer such growth at this stage of the economic transition*”.

Table 1: Post Crisis Growth Scenario 1996-2005

Base Case (no crisis)	US\$1.78 trillion
Case 1 (new growth assumptions)	US\$1.53 trillion
Case 2 (uniform efficiency gains)	US\$1.37 trillion
Case 3 (varying efficiency gains)	US\$1.36 trillion

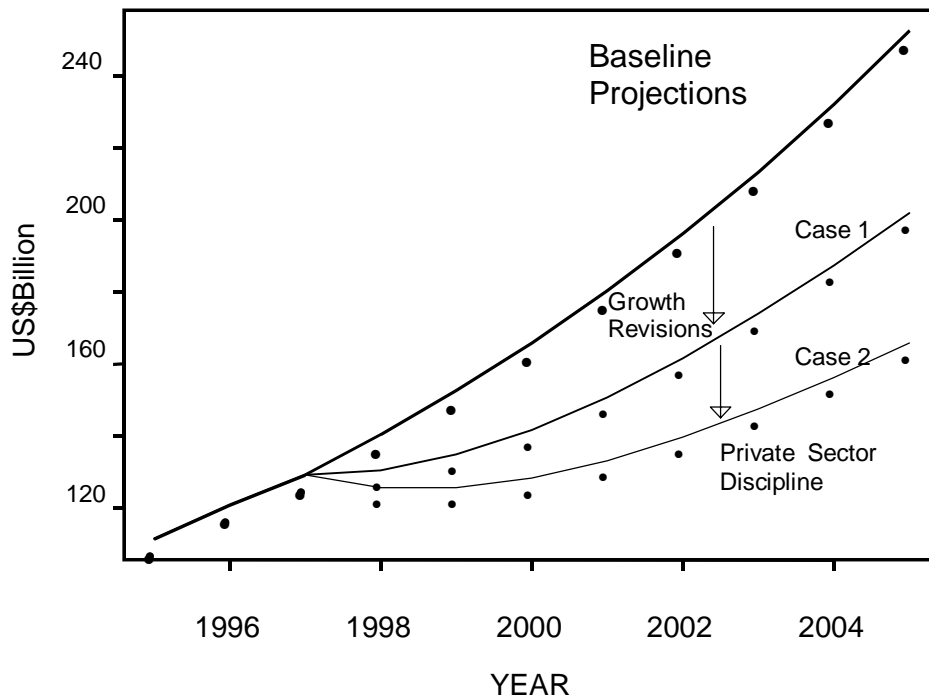
Table 2: Post Crisis Revised “Low Growth” Scenario 1996-2005

Base Case (no crisis)	US\$1.78 trillion
Case 1 (low growth assumptions)	US\$1.42 trillion
Case 2 (uniform efficiency gains)	US\$1.27 trillion
Case 3 (varying efficiency gains)	US\$1.26 trillion

11. There is a greater divergence in results between the “no transition” model (Case 1) and the transition models (Cases 2 and 3) when the period 1998-2005 is considered. This is because the transition model allows for possible efficiency gains from 1998 onwards. Figure 1 represents one way of allowing lower growth and private sector disciplines to affect projections for the post-crisis period. It is crucial to note that the numbers above are grossly in excess of the “reality check” provided by our project finance sources for Asian countries (and in particular PRC, see below).
12. Figure 1 below plots the total infrastructure forecasts for a baseline scenario which assumes that output continues to grow at the 1996 growth rate, against Case 1, where growth rates for 1998-2005 are revised down to current consensus estimates. In Case 2 an adjustment is made for the likely effect of private sector discipline on the capital requirements of a given project.
13. While it is possible to argue about the parameters driving any set of forecasts, there is no debate that the 1990s investment requirements for infrastructure in East Asia dwarfed earlier projections and experience. Massive investments in power, roads and communications did materialize, and with a changing mixture towards private funding and risk allocation, as reflected below in the project finance data. Bottlenecks in infrastructure could only be removed by increased private sector participation - to be achieved by what emerged as a vast and growing capital market.
14. The flip side of the sharp increase in private sector funding was the much noted fact that government spending, international aid and official sector lending could not be on a scale sufficient to meet these “trillion dollar plus” requirements. The private sector and the world capital market had to be the main player if anything like the discussed projections were to materialize. In a sense, it was a coincidence that the efficiency and financing requirements

came together, that best practice *and* financial imperatives pushed the same way – for reduced proportionate contributions to infrastructure spending from the public sector

Figure 1: Comparison of Estimates for Total Infrastructure Investment



1.3. Project Finance – Summary of Key Project Aggregates

15. The Project Finance database² is used to supplement understanding of the nature of the Asian crisis and its impact on infrastructure investment. This database is interesting because it captures those private sector investments in projects defined as non-recourse or limited recourse. It is therefore representative of non-public funds flowing into infrastructure project development. The data that are summarized by country and sector later in this Report, exhibit volatility and detail by country and sector consistent with the general understandings set out in this document.
16. The data in Table 3 show total dollar volume of funds injected into projects during the last four years.³ The figure of nearly US\$41 billion for the calendar year before the crisis (1996), and even the post crisis year 1998, contrast sharply with the much lower figures estimated at the end of the 1980s and into 1990. During these times, the total market for funding projects was much less than US\$5 billion, indicating that there has been a funding revolution since the

² *Capital Data Project Financeware*, Capital Data Limited, London.

³ The financial data in Table 3 provides a partial picture of the total infrastructure investment in the Region.

early 1990s, with a shift to private sector and project based financing. As indicated in Table 3, the total private sector project financing for Infrastructure Projects for the selected Asian APEC economies (Hong Kong, China, Thailand, Philippines, Chinese Taipei, South Korea, Indonesia, Malaysia and Singapore) added to US\$21.1 billion in calendar 1995, US\$41 billion in 1996; US\$26 billion for 1997 (including both pre and post crisis impacts), but dropped to US\$12.1 billion in the first full post crisis year, to December 1998. These numbers, and the changes, underline the rising importance of the private sector to the infrastructure program. The private sector can be a very large provider of infrastructure funding, if the structures are right, as discussed above, and as reviewed below in the section on “best practice”. And as we shall also see later, the sectors which showed the most resilience were those such as power, where governments were “locked in” with take-or-pay BOT contracts, thereby reducing private sector risk but increasing the risks faced by the public sector.

17. Telecoms investment data show the most dramatic decline over 1996-98, going from US\$7.1 to US\$3.4 to US\$0.4 billions; reflecting the fact that telecommunication projects are typically purely privately funded, and take demand risk in a newly open environment. The energy projects appear more resilient, typically because they have some form of government guarantee.

Table 3: Project Finance Data – Infrastructure Projects⁴

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	11,017.10	44	17,269.00	43	11,399.49	27	10,237.72	21
Gas Distribution	54.07	1	35.00	1	0.00	0	0.00	0
Gas pipeline	393.43	3	0.00	0	772.00	2	0.00	0
Gasfield exploration and development	0.00	0	90.00	1	20.60	1	0.00	0
Oil Refinery/LNG and LPG Plants	633.00	1	4,133.00	4	4,288.50	7	125.00	1
Oilfield exploration and development	50.00	1	150.00	1	700.00	2	0.00	0
Other upstream	167.20	2	0.00	0	0.00	0	0.00	0
Renewable fuel	149.73	1	0.00	0	0.00	0	0.00	0
Power	9,569.66	35	12,861.00	36	5,618.39	15	10,112.72	20
Water	559.53	7	1,374.56	8	0.00	0	246.00	1
Transport	8,059.92	31	15,168.32	30	10,813.25	29	1,230.00	5
Airport	0.00	0	11,355.21	4	724.33	4	0.00	0
Bridge	901.76	7	0.00	0	205.00	2	0.00	0
Other Infrastructure Projects	250.00	3	748.70	11	245.00	1	350.00	1
Port	262.25	5	760.39	5	909.27	6	0.00	0
Rail - Infrastructure	1,031.55	5	460.00	2	1,688.20	4	381.00	1
Urban railway/LRT/MRT	3,037.04	4	25.00	1	3,454.60	3	0.00	0
Road	2,577.31	7	1,669.02	6	3,586.86	9	119.00	1
Tunnel	0.00	0	150.00	1	0.00	0	0.00	0
Shipping	0.00	0	0.00	0	0.00	0	380.00	2
Telecommunications	1,502.30	13	7,089.64	27	3,405.92	13	359.04	2
Total	21,138.84	95	40,901.52	108	25,618.66	69	12,072.76	29

Note: Years are from Jan-Dec.

⁴ Hong Kong, China, Thailand, Philippines, Chinese Taipei, South Korea, Indonesia, Malaysia and Singapore

Source: Capital Data Project Financeware, from Capital Data Limited London

18. The numbers in Table 3 (e.g. falling from US\$40.9 billion in 1996, to US\$25.6 billion in 1997, to US\$12.1 billion in 1998), and the decline in project numbers (e.g. from 108 in 1996 to 69 in 1997 to 29 by 1998), should be contrasted to the US\$100+ billion macro model projections in Section 5 below, where there is an assumed reversion to an assumed stable relationship between infrastructure and economic growth. From Table 3, total project funding for the largest infrastructure sector, energy and power, decreased from US\$17 billion in 1996 to US\$11.4 billion in 1997, and to US\$10.2 billion in 1998. Even adjusting the macro projections for capital savings and partial phasing in of best practice (and thus capital efficient reforms), there is a major disparity between the market disciplined “project finance” numbers and the more extrapolative macro projections.
19. While the general message of this paper does not hinge critically on the precise numbers – macro or micro – the project finance data are particularly useful. They highlight the volatility of project finance in the case of infrastructure projects, but they also confirm the capacity of the private capital market to deal with massive demands if the conditions are right. As noted elsewhere in this Report, while the scale of Asian infrastructure projects is potentially vast, in the US\$100 billion per annum bracket, this scale of finance is well within world portfolio capacities, given that the regulatory and structuring framework set by governments enables the private sector to deliver on their capacity to manage and mitigate the associated risks.

POLICY ISSUES

20. While the policy thrust of the recent reports on infrastructure and private sector participation is accepted, the projections have no way of being fulfilled in the absence of sharply improved governance in the region. An investment boom of the size projected was perhaps predicated on a continuation of government continuing to take much currency and demand risk, because in the absence of the other required reforms, risks were such that the projects would not otherwise attract investment. These and other considerations would mean that the numbers were no more than an indication of what investment would need to be if growth was as projected and if the past statistical association between infrastructure and economic growth were to continue.
21. A sharp increase in private sector participation is critical if the infrastructure needs of Asia are to be met. The earlier projections reflected past statistical associations between infrastructure and economic growth, and made no real allowance for the likely consequences of a shift to private sector practice, capital market discipline or sound commercially sustainable tariff policies. Substantial, but scaled down, projections are presented in light of new income projections (see Chapter 5) and the likely capacity to absorb the perceived increases in risks. However the message is far from negative, as the infrastructure requirements remain vast and the pressure is on to produce national policies, regulatory regimes and infrastructure strategies (such as

power, transport and water resource plans) which embrace best practice forms of private sector participation in infrastructure.

22. There are also increased opportunity costs of foreign private investment in East Asian infrastructure, due to the attractiveness of investments in other parts of the world where activity and risk mixes may now seem more attractive (USA, parts of Europe and Latin America). The projections make some adjustment for these “disciplines” but by their nature it is impossible to assess accurately just how investors have adjusted, and may continue to adjust, their portfolios away from Asia. What is clear is that there is a general shift from *quantity to quality* in investment appraisal. This reappraisal tips the scale in favor of countries and sectors that are perceived to have sound governance, and are able to shift towards best practice. This reappraisal is, of course, a major opportunity for those investor countries and private sector firms with a track record in implementation of best practice privatization processes.

CRISIS CREATES OPPORTUNITY

23. On the positive side of the crisis, a major point of this paper is that as in any crisis, this one presents a major opportunity. The current financial stress in Asia and the increased scarcity of, and alternative uses for, capital means that investors are now far more demanding of sound structures and predictable regulation regimes. While the infrastructure demands of Asia are still mammoth, there are now more supporters of the sort of regulatory and other reforms that were advocated in many earlier reports on private sector participation. Whereas the projections are scaled down 24% or so, the aggregate projections are still huge when set against the levels of a decade ago. And it must also be said, as is done below, that the world capital market now has a huge financing capacity backed by greatly increased experience in structuring complex yet vast private sector infrastructure projects. To meet even the inflated estimates would amount to less than a 1% diversion of major international portfolios – and in that sense the projections may be deemed feasible. But for any such diversion of funds into East Asian infrastructure, the structures and incentives must be right - and this is the major focus of this paper - concerned as it is to embrace the shifts to best practice set out in the associated Asian Development Bank work for APEC.

1.4. Failure to Close

24. It was noted in the 1995 World Bank Report that, despite the hype, there was little activity - or financial closure - in relation to private sector participation in infrastructure in East Asia. *“Despite much talk about private investment in infrastructure, there is little action in most countries ... Hundreds of memoranda of understanding on projects totaling hundreds of billions of dollars are languishing ... Except in Malaysia and in selected areas of the Philippines (power) and Indonesia (toll roads), the public has yet to see any visible results of new strategies to involve the private sector.”* This situation has not changed qualitatively since 1995, except that there has been a large

number of IPPs, private sector water BOTs and numerous toll road and telecommunications projects implemented with private sector funds and management.

25. The challenge, post crisis, and indeed within the lingering crisis, are to learn from the experience - to move towards best practice while not preventing practical steps forward. Not all countries or infrastructure sectors have performed the same, and there are lessons to be learned. A shift from “quantity to quality” can not only deliver better outcomes for customers and facilitate increased growth - it will conserve scarce public and private capital. It will release resources for social purposes in countries hurt most by the crisis - and allow action early rather than late.

1.5. Infrastructure and Economic Growth

26. This study is *not* about the debate in some circles on the causal inter-connections between infrastructure investment and economic growth. Aschauer and others have attempted to argue of strong and positive linkages between infrastructure investment and economic growth - concluding that on the basis of econometric studies of developed economies’ output that increases of 20-40% were associated with a doubling of the public capital stock - mainly infrastructure. While these models are mechanical and unconvincing given the two-way causation and other complications, it is clear that inadequate infrastructure - roads, water and power for example - have constrained economic development in Asian countries. But this does not mean that any or all investments in infrastructure are beneficial - funds would often be far better spent maintaining or repairing existing assets, and making them perform competitively.

INCENTIVES TO MANAGE EXISTING ASSETS

27. Simply increasing infrastructure investment should thus *not* be seen as any panacea for economic development in East Asia or anywhere else. After all, it is typically in the state owned infrastructure entities that over-manning and inefficiencies have been most substantial. A higher priority should be attached to restructures - eventually including tendered asset sales - which create market based incentives to maintain assets, and to prevent, for example, the substantial water and electricity losses that typify many state owned utilities in East Asia. Once there is private sector ownership of electricity or water distribution systems, water and power losses become money losses to owners and managers. At present the financial side of such losses is typically buried in the bureaucracies, and the managers are not given adequate incentives to correct matters. New investments, by taking pressure off poorly performing assets and their institutional masters, may be quite the wrong thing.
28. Even where jobs are created in the short run, and where power, water or transport shortages are removed through extra investment - this may not mean such investments are desirable or preferred allocations of scarce capital. In general, the test should be that the returns on the investment, adjusted for any

external costs or benefits, cover the costs of capital for the appropriate risk category.

1.6. Best Practice Templates for Airports and Electricity

29. There are areas where independent analyses, including those forming part of the broader work on best practices, have confirmed that the best strategy, for example, is to create independent power generators, transport systems and airports. There should also be a well designed market structure and a regulatory regime in place which can reduce the project uncertainties despite the move to competition, and so allow lower charges to customers through the resulting cheaper finance and the overall competitive environment. The evidence, which is recent but substantial - is that economies of scale do not extend to vertically or horizontally integrated systems of generators or airports. This makes a powerful case for the sell off of such infrastructure (see NERA [1998]) within a customer friendly competitive model. This is mentioned “up front” because in countries as diverse as the PRC, Indonesia, Australia and the Philippines, the governments can obtain major funds from asset sale, which in turn releases funds to maintain or invest in other assets (i.e. sell generation assets within a competitive market to fund transmission expansion). Despite the crisis, this strategy of financing maintenance of existing assets through funds provided by selected asset sale, within a competitive structure, is an example of win-win options emerging from the crisis. Indeed, the history of major reforms is that they usually require a crisis to enable leaders to focus political minds. In this sense the East Asia currency crisis has a major upside!

1.7. IPPs - Not Full Answer

30. There is substantial evidence that the move to BOTs and independent power producers (IPPs) has promoted new investment – but this has not always helped economic development or customers. The prevalence of government guarantees and the absence of product market competition and discipline, meant that substantial excess capacity resulted from the way in which the energy crisis was addressed in the 1990s.
31. The Philippines is the classic example – brownouts in 1992-3 happened on most days of the week, often for 5-10 hours. Private power contracts to sell power to the grid relieved the crisis by 1995, but left expensive US dollar indexed contracts in place, with Napocor and thus the government exposed. More serious problems included the fact that many of the outages were not from inadequate capacity, but from breakdowns and ultimately poor maintenance and management. Incentives were not in place to induce efficient management or maintenance. In this sense the new IPPs enabled the problems to be deferred rather than be dealt with.
32. Many countries have come to realize that government guarantees of IPP contracts are often far from being the preferred solution - even if they relieve a short-term crisis. The process in many countries has just converted a deficit

into a surplus, and the currency crisis has meant that the resulting power glut has been even more serious. In Indonesia, this situation has left power utilities such as PLN with contractual obligations to buy power in US\$ well in excess of their capacity to charge customers at the new exchange rates. The IPP contracts (PPAs) have left many utilities technically bankrupt. In the Philippines, there is now widespread acceptance of the need to structure industries such as electric power in ways that create competition and accountability, and laws to this effect are now before the Philippines Senate.

1.8. Capital Market Reform the Key

33. The above currency “mis-match” point - of the risks when sales are in local currency but investor liabilities in foreign currency - focuses on domestic capital markets as a key to long-term reform in infrastructure provision. In principle, the bulk of debt funding of infrastructure services such as transport, water supply, electricity and other urban services should be in local currency - yet local debt markets are often thin, short-term or non-existent. Absent such capital market reforms, it is hard to see how even the 30% and smaller cut in the value of investment projections can materialize. The resulting pressure is for a range of measures for the international development agencies such as the Asian Development Bank to facilitate broader risk sharing, debt lengthening and a range of risk guarantee arrangements that may enable investment projections to materialize, despite the external competition for funds.
34. One reason the investment numbers may have been deemed to be so large back in 1995 was that the BOT, take-or-pay and government guarantee nature of most infrastructure deals meant that the private capital and product market discipline was not being comprehensively applied. All sorts of unviable projects looked good, but only because the risks resided with government. Investors sought comfort in official sector backing rather than from the fundamentals of the market place. The “fundamentals” of the investment market for infrastructure services should be good – since they are typically monopoly and essential services in rapidly growing economies – but these fundamentals will not be converted into reality if there is weak governance. Weak governance in this context would include a failure both to allow and enforce commercial tariff regimes, failure to promote a competitive market, and failure to conduct tenders in an efficient and transparent manner, following clear project definition.

1.9. New Infrastructure Regime Required

35. One reason successful economies do not need official projections or infrastructure master plans, is that the cost of capital applied to projects automatically adjusts to the risks and alternatives involved. Projects rule themselves in or out by their market fundamentals. However with a heavy involvement of government in infrastructure decision-making, long lists of “feasible” projects are prepared. While there is value in such lists and aggregations (see Annex), the much more important point is the need to introduce the trio of:

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- ⇒ *Capital market deepening and reforms.*
 - ⇒ *Competitive private sector approach to infrastructure provision.*
 - ⇒ *Implementation of incentive based regulatory regimes for the natural monopoly services (networks, grids, and pipelines).*

1.10. Financing Capacity

36. With the above mentioned reforms in place, creating a natural discipline on the infrastructure investment process, the financing requirements for best practice infrastructure investment should not be a problem. IMF and BIS data show that a 1% re-balancing of large international portfolios would release US\$250 billion into emerging markets.⁵ Possible redeployment of 10% of such portfolios would amount to US\$2.5 trillion! While the latter number is implausible in the current climate, there should be little doubt that those APEC countries that do restructure in the suggested ways will not be restricted by access to funds. It is the implementation of the restructure and capital market deepening which is the hard part. To the extent that capital market deepening results, and there is not a currency mis-match between revenue and debt servicing, then relatively little foreign exchange will be required.

1.11. Official Sector Support

37. Another reason why the central focus of the reform process must be a shift to private sector processes and capital market development, is that official development assistance (ODA) will not be able to meet likely demands. In the current crisis, with huge social consequences, here will also be humanitarian pressures for ODA funds to go to projects that may not pass commercial tests. The crisis countries - Indonesia, Thailand and others - will also attract substantial portions of what funds are available - making ODA a minor part of the total solution. Where the multi-lateral development banks (MDBs) and other institutional support can help is in being a catalyst for the sorts of reforms discussed here and in many other reports - the actual provision of most loan funds should be via the private sector.

1.12. Focus on Risk Mitigation - Political and Foreign Exchange

38. There are good reasons why it is undesirable that the ODA agencies dominate the infrastructure funding process - even if official funding were available on the required scale. One such reason is that with the quantitatively minor exception of the IFC part of the World Bank group and the Private Sector Group (PSG) in the ADB, the official institutions are obliged to secure government guarantees of loans - even if the infrastructure entity is being restructured as part of the process. This means that major risks are ultimately not in fact borne by the World Bank or ADB, but by the governments of the

⁵ To put these numbers in some perspective, the PRC attracted \$42 billion of FDI in 1996, 52% of all FDI and a 40% increase over 1995 (CIDA [1998], p21)

borrowing countries. This explains why most economies should be favorably disposed to well structured infrastructure programs with private sector funding - because they may be able to actually reduce total risks - or at least limit risks to those parts of the contract where government is the party best able to mitigate the risks.

39. Traditionally there has been only a small advantage in terms of pricing in favor of MDB loans. When the Asian markets were at their height, there was small advantage to inserting an MDB credit in between that of the host Government and the lender. Post-crisis, this has changed. As Asian Government credit falls, in some cases close to non-investment grade, an MDB loan (which has not been subject to the same pricing change) has significant advantages to an individual infrastructure borrowing. Added to this, the explicit advantage of longer maturity can make an MDB loan look even more attractive. But there is need for caution; advantage is only likely to accrue to two parties: first, the individual project borrower and secondly, the individual looking to inject some liquidity in a stagnant market. Experience has shown that should the private sector come to know of examples of Government credit in projects, it will seek to secure the same type of Government credit in other projects. The news travels fast and Government assistance becomes a template for each and every future project.

1.13. ODA to Support Training, Strengthening and SOE Reform

40. The above line of argument suggests that it is desirable that ODA funds increasingly be used for catalytic, training and institutional strengthening roles - roles in which the private sector does not have a comparative advantage. The institutional expertise of ADB and World Bank staff and consulting groups should be able to greatly assist most economies to restructure sectors and so implement the transition to increased private sector participation in funding, investing in and managing infrastructure in the future.

1.14. Sponsoring New Infrastructure Funds

41. A particular initiative that has been discussed in the Asian Development Bank and elsewhere is the notion that there would be major gains if some of the ODA agencies could pool resources into infrastructure funds aimed at funding competitively structured and predominantly private sector infrastructure projects. For countries that have lost "investment grade" credit rating, or whose risk category is a deterrent, such infrastructure funds with ODA support could facilitate investments that will not otherwise be possible.
42. The ADB is now involved in a range of private equity funds, including:
1. *Asia Infrastructure Fund*. The Bank approved an investment of US\$20 million in April 1994, of which US\$14.49 million was disbursed by 30 June 1997. Total fund size is US\$780 million. The Fund fully committed its capital in less than two years of operations. It has invested in 15 private sector infrastructure projects in the region.

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2. *Asian Infrastructure Development Company*. The Bank approved an investment of US\$30 million in October 1995, which has been fully disbursed. In March 1997, it had a second closing, which brings the total fund size to US\$398 million.
 3. *AIG Indian Sectoral Equity Fund*. The Bank approved an investment of US\$15 million in December 1995. The fund has raised US\$115 million from investors and commenced operations in the third quarter of 1997 and has approved an investment in a telecommunications company.
 43. The ADB also has formed the *Asian Infrastructure Mezzanine Capital Fund*. The Bank approved an investment of US\$25 million on 17 December 1996. Total fund size is US\$230 million.⁶

1.15. State Enterprise Reform Units

44. Another general point to emerge from the “best practice” reviews, is the need in most countries for specialized state owned enterprise reform units - to drive the reform and regulatory process associated with increased private sector participation. The role of the Ministry of Finance and the BOT Center in Manila has been very positive. In countries such as New Zealand and Australia the high quality end of the reform process has typically been driven from specialist and cross-sectoral reform units, usually housed in the Ministry of Finance or Treasury Departments. In Indonesia, the absence of such units has meant that other reform minded Departments such as BAPPENAS have difficulty with implementation of the reform process.

1.16. “Think big” versus Competitive Restructure

45. The discussion in this Report of the vast numbers projected against East Asia infrastructure investment will remind some of discussion in many countries where politicians have seen economic salvation emerging from large-scale and “well-timed” infrastructure projects. There have been starkly different approaches to big infrastructure projects over the last decade, as some countries have attempted to move away from a focus on large, politically driven projects towards a more market driven approach. New Zealand is one country - coming in the mid 1980s from decades of securing little income from much wealth - but which successfully shifted away from big projects, underwritten by government, as a source of economic development (e.g. gas projects). Whereas the New Zealand of the 1970s and early 1980s focussed (unsuccessfully) on large scale projects as a means of generating income - the so called and unsuccessful “think big” approach - the shift in approach from

⁶ Equity funds like the Asian Infrastructure Fund have been less successful than envisaged, partly because equity finance is less of an issue for project sponsors, and partly because they demand very high returns. On the other hand, patient debt funds on the right terms, are much more of a problem for sponsors. Hence, ADB encouragement for debt funds, for example, through the Asian Infrastructure Mezzanine Fund, is likely to be more important for future private sector participation.

the 1980s achieved substantial gains for the community. Victoria (Australia) is another example of a beneficial and customer focused shift away from large public sector infrastructure towards unbundled and competitive provision, notably in electric power (as highlighted in the best practice reports). In addition, similar reforms (with the exception of privatization) have been or are being implemented in New South Wales, South Australia and Queensland through the establishment of the National Electricity Market.

2. THE IMPACT OF THE ASIAN CURRENCY CRISIS ON INFRASTRUCTURE INVESTMENT

2.1. Overview

46. The currency crisis has created the largest and deepest shock to Asian economies in recent memory. While there had been significant criticism of aspects of the financial markets and tendering processes in many Asian countries, suggesting a need for improved governance and transparency, neither the current generation of Asian businessmen and government officials nor international commentators foresaw the crisis coming nor grasped the depth of damage that would unfold. The initial response as with all traumatic events was denial, anger and then blame. But whatever the response, current plans and future aspirations for the region as a whole have been fundamentally changed. The past will not return and Asia's future lies along a different and difficult path. However the mistakes of the past are clearer than the recipes for the future, and transitional measures remain controversial.
47. What began as a seemingly isolated market action against the Thai currency in July 1997 spread quickly to firstly affect most other currencies in the region and then to each sector of each economy. In a similar manner, consternation spread quickly among professionals engaged in the business of infrastructure development and then to the individual transactions. The effects of the impact in all cases were damaging. Hundreds of transactions were cancelled or delayed, sponsors and developers lost millions in development fees, huge swathes of value were wiped off the stock markets, the previously deep Asian cash pocket became light. The cost of credit rose upwards at a frightening rate, interest rates rising to over 50% and credit spreads widening from 100 basis points to several hundred basis points. This represented a credit view that was no longer one of debt but representative of equity risk.
48. Prior to the crisis, private sector finance represented a large portion of overall funding - US\$41 billion of funds were injected from the private sector. This volume has shrunk markedly post-crisis. What lessons should be drawn from this? What is clear is that if Asia is to recover, the story is not just about garnering renewed confidence in global financing institutions. That chance is lost as the main solution. For new capital to be allocated from the private sector - *the* major potential contributor - individual assets must pass muster. The future is not about capital reallocation in the sense of portfolio balancing, using projects as mere proxies for investments in Asian countries; rather it is about individual project opportunities. Developing assets that are correctly structured and represent a good balance of risk and reward must be a prerequisite to the recovery of Asia. For this to happen, projects need the correct environment and this typically requires more, not less, government involvement to ensure competitive bidding and transparent regulation.
49. If the new story of recovery is to be fuelled by the global markets, there is a need to look at past experience of the project based markets. To measure these "micro" and sectoral impacts, this Report has drawn upon data produced

by Euromoney's commercial ProjectFinanceWare service provided by Capital DATA which logs all capital market inflows to projects. The volume figures produced are inclusive of equity, commercial debt, bonds and mezzanine financing (Euromoney is a respected source of market information used by the majority of investment banks around the globe and is generally regarded highly in term of accuracy).

50. Table 3 shows total dollar volumes and number of transactions completed during the last few years. The data set includes all transactions that are classified as projects: those that have sought non-recourse or limited recourse finance. This is a particularly important data set to monitor since it excludes directly government or quasi-government supported transactions (but does not exclude projects where there are take-or-pay or other off-take agreements from the public sector). The data focuses attention on those projects where major risks have been adopted by the private sector i.e. on where the public-private partnership is working. The data set unfortunately excludes those fund raising programs by corporations for internal infrastructure investments but will pick up the allocation of such funds as they are subsequently injected into a project⁷.
51. The effects of the impact of the currency shocks on the infrastructure industry have been predominantly conveyed via the financial markets. While sponsors, developers and governments were typically keen to continue with planned projects on the basis of the same pricing, terms and conditions as were offered by various financial markets in the months prior to the crisis, this was not to be. Credit providers were, rightly, factoring new levels of risk into their Asian asset portfolios. The currency crisis had drastically altered the risk and reward profile, with credit providers now looking at new projects in a much more cautious manner. The speed of the reaction of separate financial markets to the crisis was different and how that affected the development process is examined below.
52. Before reviewing those data it should be recalled that infrastructure development is best described as a lumpy process. Individual projects are large and arrive at intervals which can be difficult to predict. Any examination of the numbers has to be carried out with comment on the particular characteristics of a country's infrastructure program. This, in turn, has to be set against a backdrop of the motivation of individual participants in the process. Since the infrastructure market is relatively illiquid, psychology comes to the fore.

⁷ The analysis in this Report provides a quantitative measure of the extent of the impact by looking at the number of successful transactions by country and sector. The proxy for overall infrastructure investment flows is the sum of projects listed in the Capital DATA source, by country and sector. While this is clearly only a rough indicator, it is valuable because of the finance market test involved.

2.2. *Background*

53. Prior to the crisis, Asian infrastructure investment flows were increasing year upon year, but unevenly, often influenced by major projects – e.g. the Hong Kong airport. Table 3 shows total dollar volume of funds injected into projects during the last four years. The figure of nearly US\$41 billion for the year before the crisis contrasts sharply with figures estimated at the end of the 80s and into 1990. During these times, the total market for funding projects was much less than US\$5 billion.
54. The public-private sector partnership appeared to be working and the attraction of high returns for what seemed like reasonably small risk participation brought in investors and credit providers alike. Large-scale projects had been touted as major successes by governments, sponsors and investors and the financial markets responded by seeking out and embracing new project opportunities. New airports in Hong Kong and Kuala Lumpur, light rail transportation in Malaysia and viable Indonesian power and telecom programs were all firsts. Global investors believed that the addition of Asian assets would provide needed diversification to their portfolios, plus a yield increase. The low correlation between Asian markets and the rest of the world as mirrored by the low correlation between individual Asian countries both conspired to reduce the risk of individual assets when combined with others. So went the portfolio approach to investment flows.
55. On the transaction level, there was a large influx of foreign investors and developers. The arrival of major US utilities marked a heightened level of interest in the Asian power sector and brought large amounts of capital - witness the Southern Energy acquisition of CEPA and Edison Mission Energy/Powergen's commitment to Paiton I and II. Trade magazines reported weekly on the increase in the number of banks setting up project and infrastructure finance specialist units. Improved information flows and increasing loan commitments contributed to higher comfort levels on the part of credit committees and investors. Many advisers, fresh from their experiences with the UK Private Finance Initiative or Latin American financing, re-located to the region to ply their trade. Bond specialists visited Asian sponsors to sell the US market as a volume market eager to buy Asian infrastructure debt. The optimism affected the very structure of projects offered to financial markets; and pricing and credit quality was reduced. In Indonesia, PLN was discussing new ways of laying off risk to the finance markets; market power producer structures were being considered as the next steps forward.
56. However for most of the Asian infrastructure market the optimistic plans were not to be. While market salesmen were busy selling new credit products, certain bankers were privately concerned about the deterioration in credit quality and the pricing of large projects. The above market actions provided signals to those experienced with the volatility of Asian markets that perhaps the market was heading for a correction. Certain banks reduced their credit exposure to the traditionally more risky parts of the Asian market, including

property. But there were other credit providers willing to take their place and new infrastructure teams were being built up even after the onset of the crisis.

57. The numbers in Table 3 show that private sector capital flows are very sensitive to market events and to the quality of individual projects. In the following sections the argument will be that while the project program was affected by the general fall out of the Asian currency crisis, the impact was different in each Asian country and across industry. In other words, the crisis led generally to problems in the outlook for each country, which filtered through to projects, but that there were also project specific factors. These project specific factors had to do with the industry, the types of finance and sources, and the type of BOT program that each country was following.

2.3. Effects Between Countries Were Varied

58. The successful listing of PT Telkom and PT Indosat in New York and London was seen by the Indonesian Government as a template for further privatization. Privatizations were planned in a number of infrastructure sectors in order to tap equity markets, and the success of the US bond markets in buying (and securitizing) Indonesia power risk, all pointed to there being new and more voluminous financing markets to feed the growth. PT Telkom's success in attracting major international telecommunications players to its fixed line network, together with significant international investment in Indonesia's mobile phone networks, added to this enthusiasm.
59. The infrastructure numbers in Figure 4 are dominated, both in their highs and lows, by the power sector. The resilience of the statistics for 1997 reflects the "locked in" effects of the various power purchasing agreements. The success of PT Paiton Energy and PT Jawa Power in the power sector had paved the way for a variety of new projects, as planned capacity was scheduled to be increased to over 25,000MW by 1999. The growth potential of these sectors when compared with established markets in developed western countries seemed to present a compelling case. But there were warning signals. Early in 1997 the development banks had predicted that power capacity in Java would soon exceed demand and they suggested that at current projected capacity levels, there was a need for a tariff increase to ensure that PLN did not suffer a liquidity crisis. The reality was worse. PLN was obligated by the government to overextend its off-take commitments and following the crisis PLN and customers were both unable to pay a US linked tariff.
60. The weeks following the onset of the crisis left sponsors of new projects uncertain of their future - a situation exacerbated by the uneven impact of the crisis across the region. By September, Indonesia announced that it intended to postpone US\$13.2 billion worth of infrastructure projects. Confidence in Indonesia's underlying credit had plummeted, resulting in the postponement of two oil refineries, ports, property developments and 29 toll roads. A presidential list of power projects was drawn up to include 10 power projects to remain on-track, with the majority postponed or under review (Figure 2). To date, few of these projects have been financed (Asahan and Drajat

excepted). Figure 3 shows the drop in numbers of transactions and the cessation of financing. For example, project funding for the largest infrastructure sector, energy and power, decreased dramatically from US\$4 billion in 1996 to US\$570 million in 1998. Investment in telecommunications ceased in 1998 compared to US\$2.2 billion in 1996.

Figure 2: Presidential List of Power Projects

Name	Size
<u>On Track</u>	
Paiton I (coal)	1,220MW
Paiton II (coal)	1,220MW
Tanjung Jati B (coal)	1,320MW
Sengkang (gas)	135MW
Sibolga A (coal)	200MW
Amurang (coal)	110MW
Wayang Windu (geothermal)	440MW
Dayabumi Salak (geothermal)	3x55MW
Dieng 1-3 (geothermal)	110MW
Pare-Pare (diesel)	62MW
<u>Postponed</u>	
Palembang Timur (gas)	130MW
Cilegon (coal)	400MW
Pasuruan (coal)	500MW
Cilacap (coal)	450MW
Serang (coal)	450MW
Sarulla (geothermal)	330MW
Karaha (geothermal)	220MW
Cibuni (geothermal)	10MW
Drajat (geothermal)	275MW
Sibayak (geothermal)	120MW
Patuha (units 2,3,4) (geothermal)	185MW
Dieng (unit 4) (geothermal)	55MW
Bedugul (unit 2,4) (geothermal)	110MW

<u>Review</u>	
Asahan 1 (hydropower)	180MW
Tanjung Jati A (coal)	1,320MW
Patuha (unit 1) (geothermal)	55MW
Bedugul (units 1,2) (geothermal)	100MW
Kamojang (geothermal)	65MW
Tanjung Jati C (coal)	1,770MW

Source: *Project Finance International*, 130, October 8, 1997, p. 17

Figure 3: Indonesia – Infrastructure Projects

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	4,462.14	8	4,961.96	8	4,714.10	8	570.00	2
Gas pipeline	290.85	1	0.00	0	772.00	2	0.00	0
Gasfield exploration and development	0.00	0	0.00	0	20.60	1	0.00	0
Oil Refinery/LNG and LPG Plants	633.00	1	0.00	0	2,255.50	2	0.00	0
Power	3,538.29	6	4,961.96	8	1,666.00	3	570.00	2
Water	324.91	4	0.00	0	0.00	0	246.00	1
Transport	188.96	2	1,084.02	3	1,203.51	5	50.00	1
Bridge	188.96	2	0.00	0	0.00	0	0.00	0
Other Infrastructure Projects	0.00	0	0.00	0	245.00	1	0.00	0
Port	0.00	0	0.00	0	135.50	2	0.00	0
Rail - Infrastructure	0.00	0	0.00	0	96.00	1	0.00	0
Road	0.00	0	1,084.02	3	727.01	1	0.00	0
Shipping	0.00	0	0.00	0	0.00	0	50.00	1
Telecommunications	90.21	1	2,252.77	7	2,046.92	7	0.00	0
Total	5,066.22	15	8,298.75	18	7,964.53	20	866.00	4

All figures in US\$ millions equivalent (except for number of transactions)

Source: *CapitalDATA, Euromoney, Years ending December*

61. Malaysia experienced the same general effects as the group as a whole, although perhaps not quite to the same degree, and with different cross sector outcomes (reflecting in part the lumpiness of infrastructure investments). One variation was that Malaysian projects had been financed predominantly in ringgit, thereby insulating Malaysia somewhat from the impact of currency devaluation on debt repayments. Domestic interest rates, however, increased substantially post the currency crisis, and at one stage had increased by 30-50% relative to the pre-crisis levels. As senior political figures battled with the western media and focussed on traders as the cause of Asia's woes, projects quietly ground to a halt. The success of Malaysia's transportation projects, including the STAR light rail and the North-South Highway had led to a spate of planning for new projects. Figure 4 shows the effects post-crisis. In 1998 the Government approved three new major transportation projects including the 22km Kuala Lumpur Elevated Expressway, the Pandan Corridor Highway and the Muar-Tangkak-Segamat Highway, but none of these have progressed to date.

Figure 4: Malaysia– Infrastructure Projects

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	220.00	1	1,946.00	2	1,362.46	3	717.00	1
Oil Refinery/LNG and LPG Plants	0.00	0	1,900.00	1	360.00	1	0.00	0
Oilfield exploration and development	0.00	0	0.00	0	600.00	1	0.00	0
Power	220.00	1	46.00	1	402.46	1	717.00	1
Water	0.00	0	811.36	1	0.00	0	0.00	0
Transport	3,344.62	7	825.00	1	147.20	1	0.00	0
Airport	0.00	0	825.00	1	0.00	0	0.00	0
Bridge	677.80	3	0.00	0	0.00	0	0.00	0
Port	63.00	1	0.00	0	0.00	0	0.00	0
Rail - Infrastructure	0.00	0	0.00	0	147.20	1	0.00	0
Urban railway/LRT/MRT	2,267.81	2	0.00	0	0.00	0	0.00	0
Road	336.00	1	0.00	0	0.00	0	0.00	0
Telecommunications	383.05	2	1,388.18	2	0.00	0	0.00	0
Total	3,947.67	10	4,970.54	6	1,509.66	4	717.00	1

All figures in US\$ millions equivalent (except for number of transactions)

Source: CapitalDATA, Euromoney, Years ending December

62. In other sectors, the large Bakun Dam project also ran into substantial problems. Other projects involving co-operation with neighbors, such as the 42km Unity Bridge to span the straits of Malacca, appear to have been shelved.
63. Singapore handled the crisis in a typically more restrained manner. Little time was given by way of public dialogue but the response of the Government was measured. In reality, Singapore has not been a volume user of project funds and the majority of works proceed with Government funds. Figure 5 shows how the quite limited volume of project funding has dropped off post crisis, though not to the same extent as other markets. Total project funding decreased from US\$376.8 million in 1996 to US\$216.7 million in 1998, however, project funding for energy and power increased from US\$95 million in 1996 to US\$185.9 million in 1998 (Figure 5).

Figure 5: Singapore – Infrastructure Projects

	1995		1996		1997		1998		Total	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	0.00	0	95.00	1	100.00	1	185.86	1	380.86	3
Transport	0.00	0	0.00	0	712.00	1	0.00	0	712.00	1
Telecommunications	0.00	0	281.79	2	0.00	0	30.84	1	312.63	3
Total	0.00	0	376.79	3	812.00	2	216.70	2	1,405.49	7

All figures in US\$ millions equivalent (except for number of transactions)

Source: CapitalDATA, Euromoney, Years ending December

Figure 6: Thailand – Infrastructure Projects

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	526.36	6	3,604.00	6	1,702.73	3	1,128.57	5
Gasfield exploration and development	0.00	0	90.00	1	0.00	0	0.00	0
Oil Refinery/LNG and LPG Plants	0.00	0	2,183.00	2	1,526.00	2	0.00	0
Oilfield exploration and development	0.00	0	150.00	1	0.00	0	0.00	0
Other upstream	150.00	1	0.00	0	0.00	0	0.00	0
Power	376.36	5	1,181.00	2	176.73	1	1,128.57	5
Water	140.51	1	175.00	1	0.00	0	0.00	0
Transport	257.55	2	0.00	0	2,980.35	4	0.00	0
Port	0.00	0	0.00	0	68.50	1	0.00	0
Urban railway/LRT/MRT	0.00	0	0.00	0	2,130.00	1	0.00	0
Road	257.55	2	0.00	0	781.85	2	0.00	0
Telecommunications	442.20	5	826.00	4	194.00	1	0.00	0
Total	1,366.62	14	4,605.00	11	4,877.08	8	1,128.57	5

All figures in US\$ millions equivalent (except for number of transactions)

Source: CapitalDATA, Euromoney, Years ending December

64. In Thailand, well-laid plans to develop IPPs by EGAT were thrown into confusion. Authorities were battling with the currency crisis and sponsors who had bought into the competitively tendered program had to wait and see. In September 1998, EGAT came to an agreement with IPP developers to partially share the new currency risk; the reference Baht rate of Bt27 was introduced into the PPAs. The seven IPPs continued with their negotiations, but to date only one (Nong Khae Power Project) has reached financial close. The balance had been put on hold, reportedly due to the impact of the economic crisis in projected demand. Other media intensive projects such as Hopewell's BERTS finally succumbed to pressure and were formally put to rest by the Thai Cabinet. Figure 6 shows infrastructure spending for the period 1995 –1998, project funding fell significantly from US\$4.6 billion in 1996 to US\$1.1 billion in 1998.
65. By contrast, the experience in the PRC has been materially different. The PRC has been laying careful plans for some time to formulate competitive bidding templates to attract foreign capital. The BOT program was coming to fruition with Laibin B approaching the finance market just at the time of the crisis. It was not affected and appetite for the credit at the underwriting and syndication remained strong. This allowed the PRC's other BOTs to progress: bidding went ahead in a competitive environment for Changsha Power and Chengdu Water projects. The sentiment was positive and allowed privately negotiated projects to also approach the funding markets: Meizhouwan and Shandong both achieved underwriting, although they were to experience other problems later on.
66. Figure 7 shows how the PRC infrastructure has weathered the Asian crisis to end 1998, with some notable successes. Indeed, the last twelve months can be said to be one of the PRC's most successful periods in interacting with international funding markets. The reasons for this are mixed. Given the general resilience of the countries' currency to the crisis (the Yuan is not convertible on the capital account) credit providers have been more willing to

take on long term risk. Also, given the lack of opportunity in the rest of Asia, markets have focussed more closely on the PRC. To a significant extent, however, the method by which the PRC has undertaken the BOT process must have provided some insulation against credit providers' concerns. Industry factors may also have an effect, as discussed below.

Figure 7: The Peoples' Republic of China – Infrastructure Projects

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	3,514.31	20	6,022.86	22	1,165.20	4	3,820.19	7
Gas Distribution	54.07	1	35.00	1	0.00	0	0.00	0
Gas pipeline	25.00	1	0.00	0	0.00	0	0.00	0
Oil Refinery/LNG and LPG Plants	0.00	0	0.00	0	10.00	1	125.00	1
Oilfield exploration and development	50.00	1	0.00	0	0.00	0	0.00	0
Renewable fuel	149.73	1	0.00	0	0.00	0	0.00	0
Power	3,235.51	16	5,987.86	21	1,155.20	3	3,695.19	6
Water	94.11	2	388.20	6	0.00	0	0.00	0
Transport	2,396.57	16	1,902.62	16	2,081.00	7	850.00	3
Bridge	35.00	2	0.00	0	90.00	1	0.00	0
Other Infrastructure Projects	80.00	2	197.62	6	0.00	0	350.00	1
Port	199.25	4	670.00	4	70.00	1	0.00	0
Rail - Infrastructure	708.32	4	460.00	2	795.00	1	381.00	1
Urban railway/LRT/MRT	0.00	1	25.00	1	0.00	0	0.00	0
Road	1,374.00	3	400.00	2	1,126.00	4	119.00	1
Tunnel	0.00	0	150.00	1	0.00	0	0.00	0
Telecommunications	264.89	3	20.00	2	280.00	1	0.00	0
Total	6,269.89	41	8,333.68	46	3,526.20	12	4,670.19	10

All figures in US\$ millions equivalent (except for number of transactions)

Source: CapitalDATA, Euromoney, Years ending December

67. Chinese Taipei has also been relatively little affected. Figure 8 shows that project funding increased significantly from US\$17 million in 1996 to US\$2.2 billion in 1998. In reality, Chinese Taipei is still in the middle of trying to develop a rational framework to attract infrastructure funding. Previous years' successes such as Formosa Plastics involved large swathes of domestic bank funding. So while Chinese Taipei, by virtue of its domestically funded market, was somewhat shielded from the crisis, their attempts to attract new international debt are still unsuccessful. Negotiations with the Taiwan High Speed Rail and Airport Link are progressing slowly and have yet to secure international commitments. In particular, Taiwan High Speed Rail is reported to rely on a buy-out clause from government.

Figure 8: Chinese Taipei – Infrastructure Projects

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	0.00	0	17.00	1	0.00	0	1,887.20	2
Power	0.00	0	17.00	1	0.00	0	1,887.20	2
Transport	170.00	1	0.00	0	0.00	0	0.00	0
Other Infrastructure Projects	170.00	1	0.00	0	0.00	0	0.00	0
Telecommunications	41.95	1	0.00	0	0.00	0	328.20	1
Total	211.95	2	17.00	1	0.00	0	2,215.40	3

*All figures in US\$ millions equivalent (except for number of transactions)
Source: CapitalDATA, Euromoney, Years ending December*

68. Hong Kong, China's infrastructure development has also taken a rest during the last year. Total project funding decreased significantly from US\$13 billion in 1996 to US\$2.0 billion in 1997 to US\$330 million in 1998 (Figure 8). The hardest hit sector was in transport; investment fell from US\$1.7 billion in 1996 to US\$330 million in 1998. Figure 9 shows the downturn, much of which was due to the completion of Hong Kong's vast Airport Core Program with its associated infrastructure (the figure for 1996 included \$10.5 billion for the new airport). In addition, there has been much uncertainty among planning circles in Hong Kong, China as to who will be the management executive given the change in sovereignty. 1998 was always going to be a quiet year for new projects and so the results are not surprising. That said, KCRC's West Rail program has been slated for development and financing, but with the Hong Kong Government injecting a substantial amount of equity. Despite the general downward trend there were some success stories, including the River Trade Terminal, though it too was caught up in the Asian crisis (see below).

Figure 9: Hong Kong, China – Infrastructure Projects

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	77.58	1	50.00	1	0.00	0	0.00	0
Gas pipeline	77.58	1	0.00	0	0.00	0	0.00	0
Oil Refinery/LNG and LPG Plants	0.00	0	50.00	1	0.00	0	0.00	0
Transport	1,702.22	3	10,824.48	6	1,994.60	6	330.00	1
Airport	0.00	0	10,530.21	3	597.73	2	0.00	0
Bridge	0.00	0	0.00	0	115.00	1	0.00	0
Other Infrastructure Projects	0.00	0	203.88	2	0.00	0	0.00	0
Port	0.00	0	90.39	1	635.27	2	0.00	0
Rail - Infrastructure	323.23	1	0.00	0	0.00	0	0.00	0
Urban railway/LRT/MRT	769.23	1	0.00	0	646.60	1	0.00	0
Road	609.76	1	0.00	0	0.00	0	0.00	0
Shipping	0.00	0	0.00	0	0.00	0	330.00	1
Telecommunications	0.00	0	2,099.32	4	0.00	0	0.00	0
Total	1,779.80	4	12,973.80	11	1,994.60	6	330.00	1

*All figures in US\$ millions equivalent (except for number of transactions)
Source: CapitalDATA, Euromoney, Years ending December*

69. The Philippines infrastructure market was approaching a new era prior to the crisis. In the power sector, Pagbilao, Sual and Quezon were all either financed or about to be financed by debt markets. These same three power projects also mapped out a maturation pattern in risk sharing, with a development towards more private sector risk sharing and involvement of bonds. Post crisis, First Gas Power fell foul of restricted liquidity in the debt syndication market and other power plans did not materialize. Transportation was affected in a similar way, the Manila to Clark North Rail being put on hold.

Figure 10: Philippines – Infrastructure Projects

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	2,152.50	5	572.18	2	2,355.00	8	1,928.90	3
Oil Refinery/LNG and LPG Plants	0.00	0	0.00	0	137.00	1	0.00	0
Power	2,152.50	5	572.18	2	2,218.00	7	1,928.90	3
Transport	0.00	0	517.20	3	1,328.00	2	0.00	0
Other Infrastructure Projects	0.00	0	332.20	2	0.00	0	0.00	0
Rail - Infrastructure	0.00	0	0.00	0	650.00	1	0.00	0
Urban railway/LRT/MRT	0.00	0	0.00	0	678.00	1	0.00	0
Road	0.00	0	185.00	1	0.00	0	0.00	0
Telecommunications	280.00	1	191.58	5	885.00	4	0.00	0
Total	2,432.50	6	1,280.96	10	4,568.00	14	1,928.90	3

All figures in US\$ millions equivalent (except for number of transactions)

Source: CapitalDATA, Euromoney, Years ending December

70. Republic of Korea was beginning to approach the private sector to fund its infrastructure prior to the crisis. Korean Chaebols had been given the mandate to try and develop large-scale projects on a BOT basis, including ports and power stations. In tandem with this effort, Korean banks were aggressively taking part in international project financing partly in order to improve their knowledge base. Figure 11 shows how things changed. As a result of the crisis, no projects have progressed, the column for 1998 being all zeros, and thus not included in Figure 11. Despite this 1998 cessation of private sector action, there is a recognized need to arrange an effective funding program in order to shore up Korea's beleaguered accounts. Despite the crisis, or perhaps as a result, over ten Korean industrials are due to seek partial privatization later this year to include KEPCO, POSCO, Korea Telecom and Korea Gas.

Figure 11: Republic of Korea – Infrastructure Projects

	1995		1996		1997	
	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	64.20	3	0.00	0	0.00	0
Other upstream	17.20	1	0.00	0	0.00	0
Power	47.00	2	0.00	0	0.00	0
Transport	0.00	0	15.00	1	366.60	3
Airport	0.00	0	0.00	0	126.60	2
Other Infrastructure Projects	0.00	0	15.00	1	0.00	0
Road	0.00	0	0.00	0	240.00	1
Telecommunications	0.00	0	30.00	1	0.00	0
Total	64.20	3	45.00	2	366.60	3

All figures in US\$ millions equivalent (except for number of transactions). Note that the database indicated all entries as zero for calendar 1998.

Source: CapitalDATA, Euromoney, Years ending December

2.4. Effects Varied Between Industries

71. With such a low overall volume of financing, no definitive argument can be made about a discriminatory impact of the currency crisis on differing industries. However, there exists a strong collateral case for arguing that

projects in separate industries reacted differently due to the risk and financing profile.

72. Telecoms is a case in point. Figure 12 shows the decline in telecom investment post-crisis, from US\$7.1 billion in 1996 to US\$395 million in 1998. Experience of professionals in the industry provides useful insight into why the reduction of investment flows in this sector was so sudden. The first argument has to do with the traditional reliance of the telecoms project structure on the acceptance by credit providers of market risk: both pricing and volume. Telecoms projects ask the market to accept that the capital cost will be recovered by virtue of an exponentially increasing demand curve. Absent pricing, volume controls and an effective regulatory environment for future license controls, credit providers are fully exposed to the future vagaries of the market. It is not surprising then, that at the onset of the crisis, the increase in future risk made telecoms unattractive. Since telecoms projects inherently have greater risk with unlimited downside protection, credit providers tend to require greater upside. Banks tend to fund a lower portion of debt relative to other infrastructure; equity investors are more comfortable. Following the crisis, as argued below, the liquidity of equity and bond markets dried up quickly and telecoms projects suffered accordingly.

Figure 12: Telecommunications Sector

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Telecommunications	1,502.30	13	7,089.64	27	3,405.92	13	359.04	2
Total	1,502.30	13	7,089.64	27	3,405.92	13	359.04	2

All figures in US\$ millions equivalent (except for number of transactions)

Source: CapitalDATA, Euromoney, Years ending December

73. In contrast, the energy and power sector has shown a certain level of resilience. Since a portion of demand risk usually rests with a quasi-government entity, credit providers were more comfortable that the off-take credit will be good in troubled times. As long as lenders are comfortable with the capacity versus demand projections, they are reasonably confident of the ability of the project to generate debt covering cash flows. As regards the funding markets they attract, banks and export credit agencies were strong supporters of power projects, particularly those in the PRC pre-crisis. Both types of institution are known to have long term client management issues at stake. Whether the PRC was the dominant factor in the relative success of power is unanswered, though it is noticeable that negotiations for the Thai IPPs are still continuing and Philippines San Roque hydro power project looks as if it may reach conclusion. Figure 13 illustrates energy and power transactions, for example, project funding decreased from US\$17.3 billion in 1996 to US\$10.2 billion in 1998.

Figure 13: Energy and Power Sector

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Energy and Power	11,017.10	44	17,269.00	43	11,399.49	27	10,237.72	21
Gas Distribution	54.07	1	35.00	1	0.00	0	0.00	0
Gas pipeline	393.43	3	0.00	0	772.00	2	0.00	0
Gasfield exploration and development	0.00	0	90.00	1	20.60	1	0.00	0
Oil Refinery/LNG and LPG Plants	633.00	1	4,133.00	4	4,288.50	7	125.00	1
Oilfield exploration and development	50.00	1	150.00	1	700.00	2	0.00	0
Other upstream	167.20	2	0.00	0	0.00	0	0.00	0
Renewable fuel	149.73	1	0.00	0	0.00	0	0.00	0
Power	9,569.66	35	12,861.00	36	5,618.39	15	10,112.72	20
Total	11,017.10	44	17,269.00	43	11,399.49	27	10,237.72	21

All figures in US\$ millions equivalent (except for number of transactions)

Source: CapitalDATA, Euromoney, Years ending December

74. Transportation, in a parallel fashion to telecoms, has ground to a halt. Many of the reasons for this are also similar to telecoms: the dependence on strong future user demand, in turn dependent on economic growth and the need for higher yield debt products and equity to provide funding. Transportation projects expected in Malaysia, Philippines, Indonesia and Thailand were all postponed despite extensive planning. Even in Hong Kong, West Rail did not reach its first expected fund raising. In the PRC, the expected road BOT scheme did not materialize, though a study commissioned by the ADB did conclude on the practicalities of a transportation BOT scheme for the PRC. Figure 14 illustrates that project funding in the transportation sector fell significantly from US\$15.2 billion in 1996 to US\$1.2 billion in 1998, and project funding for airports, bridges, ports, urban rail, tunnels and shipping all came to a halt in 1998.

Figure 14: Transportation Sector

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Transport	8,059.92	31	15,168.32	30	10,813.25	29	1,230.00	5
Airport	0.00	0	11,355.21	4	724.33	4	0.00	0
Bridge	901.76	7	0.00	0	205.00	2	0.00	0
Other Infrastructure Projects	250.00	3	748.70	11	245.00	1	350.00	1
Port	262.25	5	760.39	5	909.27	6	0.00	0
Rail - Infrastructure	1,031.55	5	460.00	2	1,688.20	4	381.00	1
Urban railway/LRT/MRT	3,037.04	4	25.00	1	3,454.60	3	0.00	0
Road	2,577.31	7	1,669.02	6	3,586.86	9	119.00	1
Tunnel	0.00	0	150.00	1	0.00	0	0.00	0
Shipping	0.00	0	0.00	0	0.00	0	380.00	2
Total	8,059.92	31	15,168.32	30	10,813.25	29	1,230.00	5

All figures in US\$ millions equivalent (except for number of transactions)

Source: CapitalDATA, Euromoney, Years ending December

75. Water had sporadic successes as Figure 15 shows, Chengdu advanced under the Chinese BOT scheme, and in Indonesia Thames Water achieved financing though ultimately not on the attractive terms once sought. Elsewhere, in the Philippines the Manila Water Co and Maynilad Water Services have both

made repeated attempts to garner firm interest from banks, a process which was still underway at the time of writing. Negotiations are also underway to provide for a special link in the service agreements to mitigate peso devaluation risk.

Figure 15: Water Sector

	1995		1996		1997		1998	
	Amt. m	No.	Amt. m	No.	Amt. m	No.	Amt. m	No.
Water	559.53	7	1,374.56	8	0.00	0	246.00	1
Total	559.53	7	1,374.56	8	0.00	0	246.00	1

*All figures in US\$ millions equivalent (except for number of transactions)
Source: CapitalDATA, Euromoney, Years ending December*

2.5. The Effect on the Credit Markets

76. Demands of the Asian infrastructure program upon funding markets have caused two main changes. Firstly, the ability of individual markets to understand and adopt key project risks has improved markedly. Secondly, the number of different markets open to borrowers has increased. Ten years ago there was only a handful of international banks able to accept project risk in Asia and the majority of infrastructure funding was provided by the public sector, multilateral agencies or by export credit agencies. Prior to the crisis, the complexion and depth of the market place had changed considerably, with a range of options open to borrowers. Domestic and international bank debt, category 144a bonds, private placements, export credits, multi-lateral agency funding, mezzanine financing or equity offerings were all a means to apportion risk at lower prices. Prior to the crisis, such was the optimism of those engaged in selling project bonds, that it was rumored that the old stalwart of infrastructure financing, export credits, would soon be relegated to history.
77. The currency crisis had a different affect on the willingness of each of the markets to provide funding or credit to infrastructure projects. The effect was a cascade of reducing liquidity in each market. For example, there was an almost immediate cessation of planned IPOs around Asia. Many planned privatizations were put on hold, including PLN in Indonesia, Jasa Marga in Indonesia (now to go ahead in 1999), the PRC road operators and Thai power stations. With the fall in regional stock markets, no one was going to approach the equity markets with such poor discounted valuations.
78. Next to fall in the crisis was the project bond market. Project bonds were previously gaining favor with sponsors, mainly because of cheaper costs and longer maturities in certain countries, such as Indonesia. Many new projects were seeking to access this credit market as a means to achieve financing. With the onset of the currency crisis, prices of new issues shot upwards, in most cases by several hundred basis points, effectively turning off the bond market as a means to access US and European investors. Existing issues were downgraded as the crisis deepened. Standard and Poor's changed some

ratings, e.g. in August 1998, and many issues became sub investment grade, notably in Indonesia.

79. Greater resilience was demonstrated by the commercial bank debt market. Banks are typically involved with projects throughout their inception phase, and as advisers and arrangers, and so the impact of the crisis took longer to filter through. Eventually, the crisis had a significant effect, but not so as to make the market unapproachable. True, banks were less willing to offer new commitments and were keen to see maturities reduce and pricing increase. As an example, pricing in the PRC increased from 20 to 50 basis points on an all-in yield. But, because of the sticky nature of the bank debt market as compared to the bond markets (where pricing hikes effectively turned off the market), banks remained committed to existing transactions in certain countries. The PRC, Hong Kong (China), Philippines and even Thailand all provide examples of this.
80. It has to be noted that much of the banks' willingness to stay in deals also resulted from the presence of export credit agencies (ECAs). Coface and ECGD were both present in the PRC power transactions and contributed greatly to their success. In a similar fashion, J-Exim was a major lender to Union Energy's Thai IPP and Sithe's San Roque project in the Philippines. Both these projects have been in continued negotiations throughout the crisis. Whether banks would have remained committed to these transactions absent ECAs is doubtful.
81. The cascade effect of the funding markets in withdrawing to various degrees from the infrastructure market is perhaps related as much to the time spent on individual transactions by the professionals involved as to the volatility of the markets themselves. Whether future lessons can be learnt from this is unclear, although it is apparent that for developers and sponsors of projects, it is important to match their commitments to the project and government with those from financial markets at the earliest possible time.

2.6. Magnitude of Renegotiations and Cancellation of Projects

82. The currency crisis has affected each and every stage of infrastructure development to some degree. Table 4 shows the list of projects planned in Indonesia and the PRC as at the beginning of the crisis. The majority of these have either been put on hold or postponed. Of the total set of projects planned in Asia pre-crisis, over 90% have been postponed or cancelled.

Table 4: Planned Power Projects Indonesia/The Peoples' Republic of China

POWER PROJECTS INDONESIA	POWER PROJECTS PRC
*Paiton 1 (coal), East Java	Anhui Power
*Paiton 11 (coal), East Java - Adjacent to Paiton 1	Jiaying Power Plant
*Amurang (coal), North Sulawesi	Jingyuan Power, Gansu

POWER PROJECTS INDONESIA	POWER PROJECTS PRC
*Sengkang (gas CCGT), South Sulawesi	Meizhou Wan Power Plant, Fujian
*PT Dayabumi Salak (geothermal), West Java	Nanchang Power Acquisition and Expansion, Jiangxi
Dieng 1-3 (geothermal), Central Java	*Laibin B Power, Guangxi
*Pare-Pare, South Sulawesi	*Rizhou Power Project, Shandong
*Sibolga-A, North Sumatra (coal)	*Shandong Power
West Java Power coal-fired plant	Shenzhen Eastern Power Station
Cilacap (coal)	Shunyi Power
Serang (coal)	Tangshan Power Plant
Tarahan, South Sumatra (coal)	*Three Gorges Dam (18,200MW) first plant has 14 machines for 9900MW
Sibolga-B, North Sumatra (coal)	*Puqi Power in Puqi City in Hubei province. 20 year PPA
Tanjung Jati B (coal), Central Java	Xiluodo Hydro Power Project
Tanjung Jati A (coal) - Adjacent to Tanjung Jati B	Dongfeng Minemouth Power
Tanjung Jati C (coal)	Enron Coal Slurry
Dayalistrik Pratama, Cilegon, West Java Coast	*Changsha Power
Pasuran	Wenzhou Power Plant, Zhejiang Province
East Pembang	*Huanggang Project Hubei
Colacap	Fuyang Power Project
Salak	Tuoketuo Plant, Inner Mongolia
Karaha	Jingman Plant, Hubei
Cibuni (geothermal)	Shindongkou Project, Shanghai
*Drajat (geothermal)	Dezhou Phase III Project, Shandong
Sibayak	Shanghai Zhadian Power Project
Pathua 2,3,4 (geothermal)	600 MW Power Plant in Hebei
Dieng Unit 4	Jingyuan Phase II in Gansu Province
Bedugul Units 3 & 4	
*Asahan Hydropower Plant	
Geothermal Pathua Unit 1	
Geothermal Dieng Unit 1,2,3	
Patuhu, West Java	
Pontiank, Barat West Kakimantan	
Corridor Block Gas Project	
Samarinda, East Kalimantan - GAS CCGT	
Batam, Riau - Gas CCGT	
Batakan, Gas CCGT	

POWER PROJECTS INDONESIA	POWER PROJECTS PRC
Asahan, North Sumatra	
PT Asrigita Prasarana	
Bumi Serpong Damai power (400MW) - (gas fired)	
Pasuruan	
Palembang Timur South Sumatera (gas CCGT)	
Wayang Windu (geothermal)	
Darajat, West Java (geothermal)	
Ulubelu, (geothermal)	
Lumut Balai, South Sumatra	
MW 165 Gunung Salak Power (geothermal)	
Pathua (Unit 1) (geothermal)	
Kamojang (geothermal)	
Asahan	
Asahan 1 (hydropower)	
Java Pipeline Addition Stage I	
Sengkang (gas)	
Sumatra, Java & Sulawesi Pipelines	
Pipeline Projects-Cirebon/Surabaya	
Pipelines - West Natuna & Central Java	
Pipeline to connect Arun & Natuna	
Sarulla (geothermal)	
Karaha (geothermal)	
Sibayak (geothermal)	
Bedugul (unit 2, 4) (geothermal)	
Wayang Windu (geothermal)	

*Projects that have been financed, or have a reasonable likelihood of being financed

83. Projects have been affected in a number of different stages of their development. Country and currency risks are key concerns of credit providers and have a pervasive effect on projects at all stages of their development: from planning, to negotiation, to financing, through to operation.
84. What has emerged with the onset of the crisis is that government planners and developers have become uncertain as to future growth rates and as to whether individual projects are viable. Absent accurate estimates of future growth, government planners and developers are in a hiatus. Large-scale efforts have been shelved in most Asian countries: petrochemical projects in the Philippines, Transportation projects in Malaysia, Power projects in Indonesia and Thailand. Even in the PRC, oil and gas pipelines have been postponed. A

key part of the resumption of the planning process will be good future growth figures and confidence in their stability.

85. One of the major problems for infrastructure planning is the mismatch between the planning horizon and the requirement for the project and the ability of credit markets to provide funds at the right time and on sensible conditions. Given the amount of effort and cost expended in the planning and development process, it is important to seek funding commitments at an early stage. In the Chinese BOT program, this is well recognized, and bidding sponsors are required to give firm commitments regarding the availability of finance before negotiations start. This locks in key credit providers and provides more stability to the process. Elsewhere, what the crisis has shown is that even established markets can react with volatility. This has made the planning process even more uncertain.
86. Once negotiations have been established between the public and private sectors, there exists a framework for continued dialogue despite the shocks to the economy. In the case of the Thai IPPs, the development of the bidding process was lengthy and involved international consultants and lawyers drafting documentation upon which private developers could bid competitively. It is interesting to note that post-onset of the crisis, because of the existing formal framework, negotiations continued with a view to addressing the new perception of currency risk. In the case of the power sector, the bidders in essence sought to lay off more of the currency risk onto EGAT than was originally envisaged in the documentation. In other privately negotiated or direct transactions which were not part of an international bidding process, the experience has been different.
87. Projects that were about to approach financing markets at the onset of the crisis were badly hit. As pricing shot upward in the bond markets, many Indonesian and Philippine projects had to re-address their financing strategies. In the PRC, power projects such as Siche's Puqi, which originally intended to approach the bond market had to change course quickly and attempt to garner interest from the banking sector. The banking sector, in turn, was proving to be much more difficult than perhaps expected. Existing commitments were generally honored but only to the extent they were unequivocally documented and other parties to the transaction continued their support. For example, in Indonesia, the Cikampek-Padalarang toll road was reaching the stage at which financing was fully underwritten as the crisis hit. Since Jasa Marga had originally given an undertaking to buy out the joint venture company debt in the event of certain instances of project failure, negotiations continued with committed bankers, bond buyers and ECAs. Eventually, however, there was disagreement on the apportionment of risk assumption in the light of greater currency risk and the transaction fell apart after a seven-year development process. The Tri-Energy power transaction in Thailand closed in July 1998 with a group of banks who had remained committed to the transaction for over twelve months. A critical element of this success was the introduction of new equity by Edison Mission Energy (taking over 20% of the equity commitment).

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88. Projects that already gained clear underwritten offers of finance were not out of troubled waters either. In Hong Kong (China), the banking market had already underwritten market risk of a new river trade facility whose success was essentially dependent on local trade flows in and around the Pearl River delta. Post crisis, concerns were raised as to the demand projections in the light of reduced the PRC trade flows. This macro-economic concern coupled with the knock-on effect of liquidity drying up in the Hong Kong corporate debt markets led to a difficult syndication. In the PRC, there were two main changes in the commercial bank market - the dominant funder of the PRC private projects. Firstly, the total number of international banks willing to accept the PRC risk decreased. Secondly, there was a loss of appetite of those banks that remained interested in the PRC assets. These two factors combined to considerably reduce the size of the syndication market. As an added difficulty, two privately negotiated projects, Meizhouwan and Shandong, came to the syndication market at the same time. Both had solid underwriting commitments behind them, but subsequently experienced problems reaching the depth of syndication they would ordinarily aspire to. These experiences and the inability of underwriting institutions to lay off risk in secondary markets will make future financing commitments more difficult to attain.
89. Projects that were up and running were also affected by the crisis. In Indonesia, the projected demand for both fixed wire (KSO) and mobile telecommunications services have fallen significantly, both in terms of the number of consumers and average spent per line. Rollout costs increased on a per line basis relative to revenues per line, due to the increase in cost of imported inputs such as switching equipment. PT Telkom had assisted project restructuring by accepting lower revenue sharing percentages and slower rollout commitments from the KSO project companies. However, most projects were financed in US dollars against a rupiah income stream, and have had major difficulty in meeting debt service obligations. The mobile phone operators have also experienced abnormally high “churn” rates, and collection problems from subscribers. Two of the three GSM companies have significant US dollar denominated debt obligations and no full resolution has yet been found.
90. Those projects that have reached completion face a rough and untested road ahead. The hangover of agreeing large amounts of PPA contracts will be painful as developers, bankers and Governments struggle to find common ground. The BOT model created a range of projects for the private sector. However, at the heart of these, the opportunity was not to accept risk but to seek reward knowing that Government ultimately was providing commitments as to the creditworthiness of the off-taker. With hindsight, the BOT model failed a number of countries because it was not transferring appropriate risk, was removed from customer interface and lacked the sound regulatory and tariff setting structure required to reduce those risks.
91. Indonesia provided an unfortunate example of the failure of the BOT credit structure. PLN entered a large number of contracts for the purchase of power from IPPs, which post-crisis it will not be able to honor. Neither will the users

of the power be able to meet commercially viable tariffs. The PPAs have allowed for a pass through or indexation of tariff levels to the exchange rate that has placed an overly large burden of financial commitment upon PLN and the Government of Indonesia. Estimates of the financial commitments amount to US\$1.2 billion in 1999 and rise to US\$4.5 billion in 2005. The total committed power at stake is approximately 6,500 MW. Discussion now centers on how to solve what has become a major problem.

2.6.1. The Currency Crisis, Renegotiations and Force Majeure

92. That the currency crisis was unexpected is undoubted. The magnitude of currency devaluation and the timing of onset were not predicted by any major institution. Much of the financial modeling and forecasting of the future likely currency movements was on the basis of a creeping 3-5% devaluation per year, maximum. On this, most parties - private sector and Government - were agreed. Official forecasts on currencies such as the Rupiah pre-crisis were positive, despite widespread concerns about many aspects of the banking and investment process in Indonesia. The eventual devaluation of up to 80% was therefore totally unforeseen. Given the degree and severity of the shock can it be argued that the currency crisis has caused a force majeure?
93. The general test of force majeure falls into two categories: an unexpected and an uncontrollable event. The currency crisis passes the first without argument. It is the second that causes debate. Was the currency crisis uncontrollable or was it within Indonesia's ability to avoid through improved corporate and financial governance? While the private sector will clearly argue that currency stability does not fall within its bailiwick and should be within the control of the host Government, it was in fact the lack of governance in relation to the private sector that resulted in a major loss of confidence in the economy. The PPAs were drafted so that the responsibility for currency movements was clearly with the utility, in Indonesia's case PLN, in terms of the formulaic off-take agreements. But this does not really advance the argument. Is the apportionment or non-apportionment of blame really the issue; perhaps it is more about what is workable on a case by case basis, and how these solutions affect future market sentiment.
94. At a purely analytical level there are a limited number of options open to the government of Indonesia. Broadly these fall into three categories:
- Government assumes the payment obligation;
 - Government seeks a re-negotiation of contracts; or
 - Government walks away from any obligation.

The first and last option place all the restitution risks on one party and is unlikely therefore to be adopted as the way forward. With these in mind, it is clear all parties have a common objective - economically viable projects. However there is no simple formula to achieve this objective. Past history is a

good judge of how best to progress what is essentially a work out situation. General principles are always difficult to define at the outset and are usually incorrect. Just as individual projects are put together by individual negotiations, so it is the case with the re-negotiation of projects. What is true, is that most parties should accept some degree of compromise, for instance:

- the banks may accept lower margins, less security and longer maturities;
 - developers may accept partial exchange risk, lower equity returns and replacement assets; and
 - government may accept various levels of support programs, credit enhancements and first rights to bid for future assets.
95. Otherwise there is no solution and the private sector development process ceases. The key to success of the process is engagement and continuing negotiation.

3. SECTORAL FRAMEWORKS AND BEST PRACTICES IN INFRASTRUCTURE

3.1. *Facilitating Beneficial Private Sector Investment.*

96. This section draws, in part, on the conclusions from the Asian Development Bank study for APEC, which focuses on electric power, water, airports, ports and transport (mainly expressways), which raise many different and complex issues, and which will be available in due course.
97. In this paper, reference is made more to electricity than to other sectors, in part because the budgetary and financial implications of reform are largest in this area. This is because there is a clear and proven template for best practice in the case of electric power and a resulting capacity to fund beneficial public and private sector activities through suggested privatization processes. Water and transport, on the other hand, are areas where the complexities and externalities can often be more complicated, raising issues that can greatly complicate the process of forming public/private partnerships. The electricity template includes a shift to competition in generation and eventually to trading across a grid and possibly via a power pool.
98. As noted earlier, the non-viability of many current IPPs and PPAs, and the currency and force majeure situation in countries such as Indonesia, suggest a need to both renegotiate contracts and to explore asset sale potential. In the current tight financial situation, raising finances *and* implementing efficient reforms is a win-win situation, since both of these improve finances and signal to the external community that the country is serious about economic reform. Without major planning processes being completed and given the complex externality concerns, it is right to be cautious in respect to asset sales in the case of some water and transport sector assets. But these concerns, just like the need for subsidies in some areas, do not imply that private sector participation should not proceed, but rather that regulatory processes need to be increasingly sophisticated and transparent. And in the case of the more sensitive water and transport service areas, and electricity distribution, the concession model may generally be more applicable.
99. As the studies are generally concerned with maximizing the economic and social benefits of desirable private sector participation in infrastructure – the goal is far broader than just promoting private investment. Nevertheless, there will be no public/private partnerships without the private sector and the practices which are fundamental to encouraging investment are included, noting that the increase in private sector investment is not an end in itself.

3.1.1. Best Practice Themes

100. The best practice themes have been divided into the following categories:

- ❑ Formation of a state owned enterprise reform unit, with sector sub-units – reporting to top level Ministers and advising on key issues such as those below.
- ❑ Government legislative activities – basically to facilitate the processes listed here.
- ❑ Policy reform and planning - including transport masterplans and water resources strategies.
- ❑ Assignment of risks in private sector participation contracts according to capacity to mitigate risks - to be advised on and monitored by a reform unit.
- ❑ Regulatory processes – transparent and independent.
- ❑ Practices defining access to natural monopoly or “network” assets – balancing incentives to invest in, or gain access to such assets.
- ❑ Capital market policies – facilitation of deeper and broader domestic capital markets.
- ❑ General economic policies (labor, competition, tax and investment regulation).
- ❑ Policies aimed at maximizing benefits from existing assets (including poorly performing ports, airports, water supply and electricity distribution systems, generators and water treatment, transport systems).
- ❑ Policies aimed at facilitating new investments, with domestic and foreign capital.
- ❑ Environmental policies – aimed at achieving clearly defined goals at least cost.
- ❑ Communications policies – aimed at documenting benefits of restructure, re-regulation and privatization – including evidence from good and bad examples elsewhere. Target audiences include the full range – Ministers, politicians, bureaucracy, trade unions and staff associations, business groups and the broader community.

3.2. *Driving Reform – A State Enterprise Reform Unit*

101. Most state owned enterprises (SOEs) – whether in water, electricity, transport or other forms of urban infrastructure – are often subject to internal constraints which prevent them from driving the reform process in the preferred direction. There are internal, human resource and other constraints on being “ones own

-
- surgeon”. Where there has been major SOE reform, including restructure, unbundling and privatization – the key economic ministers and the Ministry of Finance are usually key players; at the end, if not at the beginning of the reform process.
102. Often there is a need for Prime Ministerial/Cabinet/Presidential endorsement of such a unit and its agenda – which also requires due process involving key economic ministries. This SOE reform unit (labeled SOERU), should contain a specially trained and expert group which can be a useful focal point for international development agencies and banks, public and private sector agencies and others interested in participating in the process of restructure of utilities.
 103. This need for a well-supported independent “driver” reflects the need to separate sectoral policy from general governance issues. While any such SOERU would need to second persons with specialized sectoral expertise – say from airports if there is an airports privatization program - it seems clear that these persons, when transferred into such a unit should also be required to stand back from sectoral issues.
 104. Another dimension of the recommended formation of a reform unit, is that there is a need to address the fundamentals of governance – such that there can be confidence in the private sector that commitments of funds, time and personnel to expressing interest and bidding for infrastructure projects will not be wasted – that there will not be preferred access on non-competitive grounds. Large sums are involved in bidding for most infrastructure projects, and there are reputation effects on both governments and private sector investors when things go wrong. The value of an expert and independent reform group is that it can give broad-based confidence in the system. either in terms of new investment or asset sale.
 105. Where the sector Ministry or utility alone drives the reform and restructure process, there is a danger of non-completion, or non-closure. Typically departmental or utility-based reform units will lack broad-based finance and privatization expertise. The SOERU, on the other hand, would be especially selected to cover key issues, and would report to a Minister or Committee of Ministers, usually involving both Finance and the relevant infrastructure Minister, but with the former having the casting vote.
 106. The main task of the SOERU would be to manage or commission scoping studies in collaboration with line agencies. These studies would review issues, options and strategies that could lead to reform and restructure. The early stages of development of an independent regulator will also require leadership and drive which can be provided by a SOERU. They could also advise on formation of specialized task forces, regulatory units and generally be a source of expertise across sectors. Technical agencies (e.g. on water quality monitoring) which feed into monitoring of contract performance, would also interface with a SOERU.

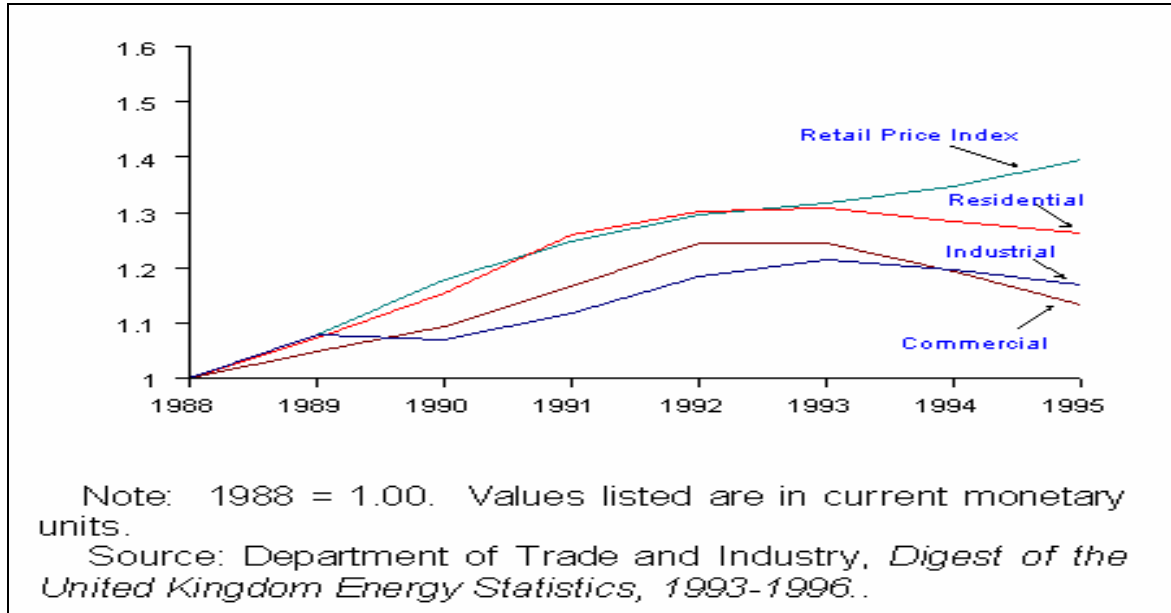
3.3. Sector Best Practice Issues

3.3.1. Electric Power

107. The sharp increase in private sector participation in the electricity industry in the 1990's had been prompted initially by serious excess demand and problems of outages in countries such as the Philippines, the PRC and Malaysia, for example. The excess demand has been predominantly because of rapid economic growth and constrained supply, but there is considerable evidence that part of the problem has also been poor governance arrangements relating to new generation. Power purchasing agreements have been entered into well in excess of future electricity demands, demands that would have moderated in response to appropriate price signals and scope for transferring or wheeling power across distribution areas.
108. For example, failure to implement competitive interchange regimes has meant that there has been inadequate use of prices and trading as means of facilitating supply in region X from units in Y at time t, in effect reducing the need for large reserve plant margins. Peak load tariffs, or 1/2 hour tariffs, as is now becoming the best practice norm, can cause customers who have flexibility to use power off peak, and can induce hydro generators to create capacity at peak time across the grid. The threat of competition, by trading over the grid, can induce better management and work practices – and efficiency and load factors can be improved by 25% or more, judging from international experience.
109. The rapid spread of BOT projects, typically with take-or-pay contracts guaranteed by the state utilities and thus governments, reflected a concern to substantially increase generating capacity, and fast. There was less concern with the tariff implications or for the sustainability of the industry than with resolution of brownout crises. This shift to the BOT model was not restricted to East Asia - even in Victoria, the first form of private sector participation in electricity generation – Loy Yang – involved government guarantees and substantially higher tariffs payable to the generator, with the high producer tariff buried in general electricity charges.
110. Similarly, with the spread of independent power producers (IPP's) in the PRC, Indonesia, Malaysia and Philippines, there was an acceptance both of substantially higher producer tariffs and, resulting from the guarantees and take-or-pay contracts having US\$ dimensions, there was a resulting sharp increase in foreign exchange exposure for the relevant governments. This is why utilities such as PLN in Indonesia are technically bankrupt. Their income from sales of electricity will no longer be able to meet US\$ repayment commitments.
111. The above shift to a BOT, bulk supply and government guaranteed set of arrangements for electricity is one reason for reviewing best practice. There is no reason in terms of supply of essential commodities on a monopoly basis for there to be substantial risk, on a scale that would deter private investment.

Income should be secure, so long as funding is in currencies that match borrowings and competitive markets govern supply additions.

Figure 16: Index of UK Electricity Prices, 1988-1995

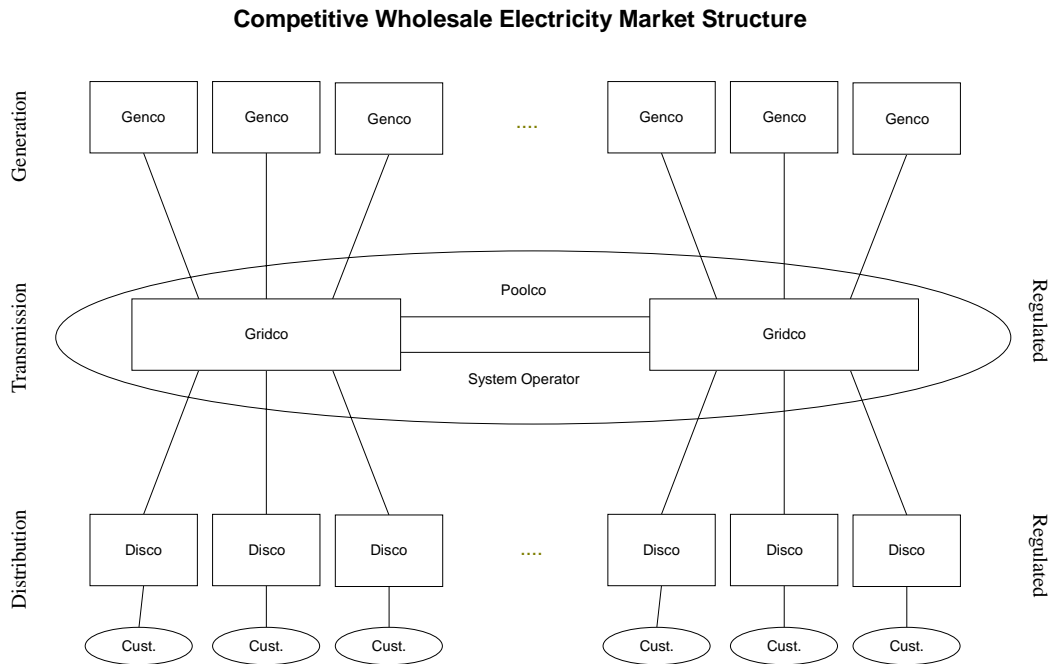


112. Leaving the currency and capital market issue aside for the moment, the main development in the 1990's in the case of electricity has been a shift to horizontal and vertical unbundling, mixed with privatization. The original innovation took place in the UK; however the UK model focussed more on the investor than on the consumer and failed to create fully competitive conditions in generation.
113. Nevertheless, the benefits were substantial, as the chart above confirms. The model that has now evolved in Victoria goes the next step towards competition in generation and customer focus. The outcome for consumers in Victoria has been greatly improved – with evidence of cost decreasing in the range of 10 - 40%.⁸

⁸ In February 1997, the New South Wales Independent Pricing and Regulatory Tribunal reported that wholesale electricity prices in Australia have steadily decreased since 1993, representing a 32-% drop in real terms over a four-year period. Victoria has also realised a decline in electricity prices of 6% as well as improvements in service quality. Due to continued improvements in labour productivity between the years of 1991 and 1995, returns on assets have also increased. The labour productivity increases have, in particular, been attributed to Victoria's reform and privatisation efforts. An Australian Chamber of Manufacturers' (ACM) survey of its contestable customers (large end users) in Victoria reported that approximately 2,500 Victorian companies were eligible to enter the wholesale power market in 1996. The survey was developed to examine prices, customer satisfaction with service, and supply conditions in the market. Of the 800 contestable customers who were given the survey, the ACM had 312 respondents. Of the 312 respondents, about 78% of the respondents believed their negotiated electricity prices were cheaper compared to rates prior to the 1994 beginning of the Victorian wholesale power market. Only 10% believed they were worse off under the new

114. The key to the emerging best practice reforms is the separation or functional unbundling of the vertically integrated system. Whereas it had been thought sufficient to separate generation from transmission and distribution, recent evidence and analysis suggests there is a need to go much further and to create a pool dispatch system and an access regime for transmission and distribution, which facilitates competitive trading and retailing across the system (see Figure 17).

Figure 17: Transmission Investment and Competitive Electricity Markets



115. Figure 17 summarizes a competitive wholesale market in which the various generator companies (Genco's) are dispatched every half hour into a transmission grid, in order of bids submitted to the Pool for the relevant time frame, 24 hours in advance. The pool management company, which is subject to regulation, is responsible for managing dispatch and allocation to distributors, who, in turn, are responsible for supply to customers. The pool may have within it a range of transmission grids, hopefully interconnected (as physical trade in electricity cannot occur if between transmission grids that are

arrangements. The average price reduction response per respondent was about 10%, with savings varying between 1% and 39%. While price was the major consideration for most customers when choosing a supplier, almost 33% of the contestable customers reported an improvement in service, while almost 64% reported no change. As for supply conditions, of the 312 respondents, 93% had negotiated a new contract subsequent to the 1994 reform. Thirty-five % of the respondents who had negotiated a new distribution contract had also changed their electricity supplier. Source:

<http://www.eia.doe.gov/emeu/pgem/electric/ch3l6.html>

not interconnected) and with tariffs for transmission which reflect transmission and potential congestion costs.

116. The agreement to have regulated “wires” charges for high and low voltage transmission, and access to pooled electricity, means that in principle, any customer with the relevant metering can contract through a retailer or distributor for power, with that retailer or distributor, in turn, contracting with the generator.
117. There is a sense in which “best practice” involves forming *two* markets in electricity – a physical market, electrons based, which is stabilized by the system operator who, in turn, will have access to the services of hydro stations with spinning reserve, which can thereby stabilize the frequency of the system. There is also a financial element to the market, with customers, including aggregations of customers, bargaining either directly or with distributors for the supply of power. The pool company generates pool-clearing prices per kilowatt hour, which vary by time of day and with 48 half hour periods being the new standard. In fact, in Victoria, the time interval for reporting on system information is now 5 minutes.
118. The short-run market for power is managed in a fashion which minimizes total system costs, by dispatching generators in increasing order of marginal cost as specified in the resulting merit “order”. The revolution in the new system is that generators get paid on the basis of the power pool price for that time slot, with low cost generators making an operating surplus relative to those at the margin.
119. While the details of power pool operations and methods for adjusting tariffs to allow for congestion and to finance expanded transmission capacity are matters for a more technical document, it is worth noting that the new competitive structure for electricity, as exemplified in Victoria, has some very desirable financing features. By introducing the concept of competition in the power pool, and by obliging distributors to “wheel” power across their wires from any willing seller to willing buyer for regulated charges per kWh. The consequences in terms of potential monopoly power of selling generation assets are minimal, which also depends to a large extent on the structure of the market such as the size of the generating units, the nature of regulation, and the structure and rules of the electricity pool. This enables substantial sell-off of generators with the funds then being available to government for general purposes that could include financing new transmission assets, or anything else. In the case of Victoria, a state with less than 5 million people, the resulting asset sales generated funds in excess of A\$20 billion, an amount roughly equal to 50% of the state debt. Given the precarious situation in many East Asian economies, the debt situation and the foreign currency liabilities of the power utilities, the attractiveness of the competitive or best practice electricity model is substantial.
120. The previous direct negotiation, generator specific tariff model, as applied in the PRC, Indonesia, Philippines and elsewhere meant that there were a range

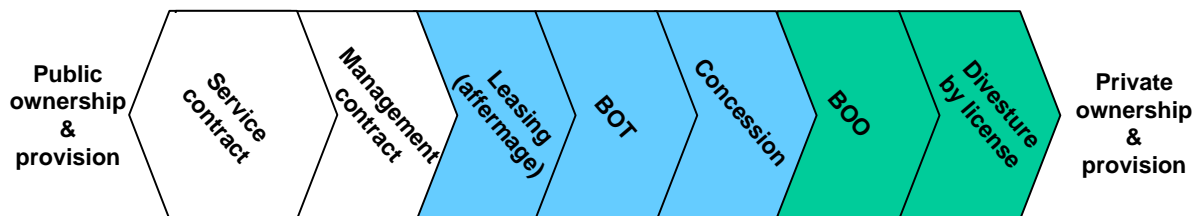
of new producer prices for electricity for each BOT unit, with these prices subsequently being far in excess of the system capacity to pay. Whilst the PRC has not suffered the same fate as Indonesia or some other countries in terms of foreign currency obligations for electricity PPAs, the PRC has a range of PPA prices on their power purchasing agreements which bear little relationship to best practice or system cost. Accordingly, the benefits from shifting towards the best practice model in electricity are substantial. More efficient use of scarce energy resources could generate 20 to 40% resource savings and a new found capacity to reduce internal and external debt through sales of generator units.

121. By moving towards a price signaling system reflecting long run marginal costs, as reflected through the dispatch bids which balance the system, it is possible to meet the excess demands in location X by trading power from generators Y and Z. Additionally, as the prices vary across time, this also causes customers to substitute demand across the time of day, which fills out and flattens the load curve. The outcome is a reduced need for new generation capacity; trading has, in effect, released new generating capacity to the system as a whole.

3.3.2. Water Supply

122. Private sector participation in water supply involves a continuum of options from a relatively low level of private sector participation to a high level of private asset ownership and management (Figure 18).

Figure 18: Private Sector Participation Options – a Continuum



123. The choice of the most appropriate private sector participation option for a particular country at a particular point in time will depend on a number of factors. These include:
 - the level of government and community support for private sector involvement;
 - the nature of the problem at hand, the lack of investment funds, the lack of expertise etc.; and
 - the speed with which the problem needs to be resolved.
124. All of the private sector participation options play a role in bringing private sector expertise and incentives into the water supply sector. Table 5 sets out

the potential benefits of the private sector options. It should be borne in mind that the quality of the contract will play an important part in achieving benefits from all private sector participation options. Good quality contracts will, amongst other things, encompass an appropriate allocation of risks. Further, except for service contracts, a transparent and well considered regulatory framework is important in maximizing the benefits of private sector participation. The enterprise reform unit and the state enterprise reform unit play a critical role in all of these areas.

125. Where there is government or substantial public concern about private sector investment in water supply, experience with some of the options towards the public sector end of the continuum can help allay concerns. However, in these circumstances care should be taken to ensure that the move towards private sector provision does not stop there. Sunset provisions reviewing the arrangements may facilitate moves forward.
126. Government needs to aim at public acceptance of the need for private sector investment so that moves to best practice can be implemented.
127. In the meantime, BOT, BOOT and ROT (rehabilitate, operate and transfer) arrangements can relatively quickly bring expertise and finance to a water supply project if investments in new sources of bulk water supply are required within a tight time frame. Effective implementation of these contracts requires careful attention to the design of tender documents and care should be taken to ensure that contracts do not become an unnecessarily expensive way of substituting private debt for public debt, and that they do not preclude the ultimate goal of “benchmark competitive” concessions.

Table 5: Potential Benefits of Various Private Sector Participation Options

<i>Service Contracts</i>	<i>Management Contracts</i>	<i>Lease</i>	<i>Concession</i>	<i>BOT/BOOT/ROT*</i>	<i>Divestiture</i>
Promotes competition in area of contract	Can improved service	Can increase efficiency of asset management – increases profits	Takes over management of operations from government	A fast option for improving bulk water supply.	A fast option for improving bulk water supply.
If contract fails, risk is relatively low	Reduced risks to government and contractor	Reduced government risk of not collecting adequate tariffs	Relieves government of need to fund investments	Full responsibility for operations, capital raising and investment goes to private sector	Full responsibility for operations, capital raising and investment goes to private sector
Contracts of short duration - if problems with contract – can easily re-tender	Potential first step to concession contract	Proportion of management responsibility and commercial risk transferred	Full responsibility for operations, capital raising and investment goes to private sector	Potentially large improvements in operating efficiency of bulk assets	Potentially large improvements in operating efficiency of water utility
Easy/Simple contractual form	Potential for setting performance standards (with incentives to achieve standards)	Incentives for contractor to minimize costs, provide reliable services and maximize revenue collection	Potentially large improvements in operating efficiency	Full private sector incentives in bulk supply	Full private sector incentives in bulk supply
Potential starting point for PSP	Scope to introduce private sector management skills		Full private sector incentives across utility	Attractive to private financial institutions	Attractive to private financial institutions
Can increase utility's focus on core business	Limited commercial risks		Attractive to private financial institutions	Mobilizes private finance for new investments	Mobilizes private finance for new investments
Potential for efficiency gains in the area covered by contract	Can revert to in-house management or contract may be retendered if problems arise.			Addresses funding shortfall	Addresses any funding shortfall. Could be successful where there is good track record of private sector ownership
	Potential for utility to bring in competition				Private water company would have clear incentives and achieve full cost recovery

* Build-Operate-Transfer (BOT); Build-Own-Operate-Transfer(BOOT) and Rehabilitate-Operate-Transfer(ROT)

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128. It is also of critical importance to recognize that the BOT type contracts that cover supply of bulk water are supplying only an intermediate input. The major water losses and inefficiencies are in the distribution systems. This makes it critical that privatization initiatives eventually go beyond the bulk “BOT” style deals to full concessions, where the regulatory structures are in place. These contracts can be expected to lead to an increase in the retail utility’s costs. This cost increase needs to be recognized by the utility and the Government and ideally, retail water tariffs should be adjusted to account for this change.
 129. Concession contracts are probably the best option if governments are committed to private sector investment but are not prepared to consider full divestment of sensitive water related assets. By concession contracts here is meant a legal agreement applied to the water supply distribution (retail) end of the water supply system. (However, the word is applied to an integrated water supply system from bulk through to retail). Concessions can provide incentives to expand the customer base, increase investment, maintain existing assets and, most importantly, reduce technical and non-technical losses within water distribution networks.
 130. Divestiture and BOT/BOO involve 100% private sector ownership and operation of key parts of the water supply infrastructure. A government joint venture with the private sector is a variation to both of these arrangements, but is less advisable, given the dual role of government. All these forms of private sector participation, however, require a strong commitment from government, a well-researched and negotiated contract and a strong regulatory and institutional environment.

COMPETITION OPTIONS

131. In the absence of some regulatory or sectoral intervention, such as unbundling, the supply of water to a particular area will be by a regional monopoly. The potential to increase competition within the market is, in most cases, relatively limited, however, competition for the market itself is possible and desirable.
132. Competition for the market requires the private sector, through a process of competitive tendering, to bid to provide water supply services. Competition for the market can rarely be achieved through one-to-one direct negotiations.
133. Structural reform by breaking up water utilities vertically or horizontally into smaller business units can also, directly or indirectly, lead to increased competition. Central to any analysis of structural reform is the notion of whether it would be worthwhile to move away from a unified entity towards a set of separate companies with separate boards and legal accountabilities. Ultimately, judgments must be made on whether the competition gains outweigh any unbundling costs.
134. Third party access regimes seek to increase competition by allowing businesses, other than the owner of a water supply network, to utilize those infrastructure services of the network which are crucial for achieving

competition in another market. Access can generate real competitive pressure in upstream or downstream markets. This pressure will encourage water supply companies to minimize their costs and charge competitive water tariffs.

RISK MITIGATION AND MANAGEMENT

135. The specificity of assets, histories, political climate, regulatory frameworks, environmental factors and differing capital market situations means that optimal risk allocation is likely to vary between countries and even between different water utilities in the one economy.
136. That said, an in principal starting point for risk allocation is that:
- *risks should be allocated to the party that can mitigate and manage the risk most effectively;*
 - *commercial risks should generally be allocated to the private sector;*
 - *non-commercial risks should generally be borne by government or customers; and*
 - *where no party has a clear comparative advantage in managing the risks they should be shared or a matter for negotiation.*
137. Ideally, there should be a balancing of risks and penalties.
138. Careful identification, analysis and ranking of risks by an expert team *before* competitive tendering is a key to best practice in risk mitigation and management. Risks should be identified, analyzed and then ranked.

ECONOMY WIDE REFORMS

139. A top priority, but hard to achieve, in promoting privatization of infrastructure such as water supply, is the development of the local capital market as much as possible, so as to be able to match the currency of borrowing with revenue.
140. A better developed capital market in many economies would facilitate a match of the currency of borrowing with the revenue stream from the investment. One mechanism that the Asian Development Bank can advance to deal with the problem is a mechanism for enabling short term debt to be stretched into longer maturities. This capital market transformation and deepening issue (i.e. the development of a liquid bond market) is one which deserves immediate attention.

IN-DEPTH COUNTRY STUDIES

141. Case studies have been undertaken relating to the experiences of private sector investment in the water supplies in Macau, Johor Bahru in Malaysia and Manila in the Philippines. These case studies help to identify “best practices” that can be replicated in most economies.

3.3.3. Airports

142. After an examination of partial and full models of privatization, it appears that the international predominance of partial privatization models is a reflection largely of the absence of satisfactory regulatory arrangements, which, in turn, creates a situation where government is reluctant to cede control of an asset deemed both vital and national.
143. It is also noted that there are economies of scale within an airport; larger can be cheaper and better per passenger or freight unit. A two runway airport can offer a wider range of inter-connects and other benefits. But there is no evidence that increasing returns extend to ownership of multiple airports (as in the UK Government decision to transfer all seven British Airport Authority Airports to the privatized BAA plc). The more recent policy of the Australian Government in disposing of Federal Airports Corporations airports individually, rather than as a group, is more in line with the economics of the business, and will offer larger benefits and enable more effective regulation in the long run, by introducing an element of yardstick competition or competition by comparison.
144. Regulatory issues, in this case and importantly, air traffic control (ATC) at individual airports must be closely integrated with related systems covering broad on route areas. While many of the key services, including key aspects of ATC can be made contestable, and subject to tender or auction, Government, military and civilian interfaces must be secure and well regulated, and no doubt it is fear of these systems not being in place that is leading many governments not to adopt the preferred privatization model in respect of airports. The Australian experience shows that governments can raise many billions of dollars by making airports more efficient and cheaper (landing fees were constrained to decrease in real terms as part of the tender process). The regulatory and ATC issues have not to date proved to be controversial – in a country where many are predisposed to debate privatization at every opportunity.
145. The centrality of getting regulatory processes right is highlighted most visibly to the general public in the case of airports where there has been decades of abuse of airport monopolies (duty free, food and most importantly landing and docking slots). Thus, while there is a real need to focus on regulatory issues if there is to be public support for best practice in terms of consumer outcomes, it should not be assumed that the externalities issues (airport noise, safety and pollution) in any way make a case against full airport privatization.

3.3.4. Transport (expressways)

146. Tollway projects are sharply distinguished from those infrastructure services such as electricity, telecom, airports and water – where there are markets and mechanisms for charging all customers, and all who benefit. Toll roads, when viewed as part of a total system, involve other roads and interfaces which people regard as free services – thereby creating pervasive congestion problems. It is argued that while private sector participation in roads is the

new delivery mechanism, and that private sector funding is the inevitable result, there is no alternative but for a different but positive approach to roads, railways and other communications sectors.

147. Many road BOTs in Asia are poor examples of private sector participation, because in many if not most cases the private sector funding is underwritten by government – it is not true risk capital. But the reason for this government participation in (demand) risk sharing is that, the PRC aside, most projects do not have demand figures large enough to pay for implementation, operations, maintenance and adequate returns on risk capital. The case for securitization of tollway revenue, and allocation of construction and operations risk to the private sector would seem highly applicable in the PRC and other countries where demand growth is more assured. There are major financial and efficiency benefits for government and the community, which are vast in the case of the PRC.
148. The PRC is an exception to the above, owing to extraordinary volumes of potential traffic on opening – alternative roads are congested, narrow and unattractive to passengers. Additionally, in the PRC, capital costs are low, thanks to cheap local labor. The emergence of an inner-city network in the PRC also means there is much volume upside.
149. Given the externalities, the top priority for East Asia in transport, is that there first be developed a transport policy and associated strategy. There is a sense, as with water and electricity BOTs, that government “plans” and early forms of BOT have in many ways been part of the problem – by drawing lines and negotiating toll roads between two destination, politicians have been able to “solve” particular congestion problems. To the extent this has prevented the development of integrated masterplans, or transport policies, the short-term solutions have been a mixed blessing.
150. Transport planning strategy is suggested as a priority item for the list of priorities, with the proposed SOE reform unit having specialist road and transport sections. However, because government must play a much larger role in development of expressways and other transport systems than in the case of say electricity, airports or telecoms, there should be no illusion that the privatization model as applied to transport as implying anything other than an *expansion* of the strategic planning role by government.

3.3.5. Ports

151. Private participation in ports raises many issues well outside the ambit of this report. While the general principles associated with best practice privatization can be applied, such as the separation of potentially contestable businesses (container terminals, stevedoring) from natural monopolies (channel entrance, key docks) there are a number of complications. Many ports are dominated by particular commodities such as petroleum, resources and grains, and have complex linkage or interface issues for passengers or containers needing to use other transport systems (buses, trucks, rail). In some cases, ports have been

financed by shipping companies, raising questions of vertical integration and restricted competition. In other cases, if a port is of insufficient size to allow competition within the port, there are limitations to competition between ports.

152. In general, the need for a regulatory authority to oversee the monopoly elements of ports is no different from other elements of infrastructure. Similarly, it is clear that where there is scope for creating a number of container ports or companies in competition those opportunities should be assessed. Again, there is a need for an expert group – to sort out the costs and benefits of unbundling or selling ports.
153. A popular emerging model of best practice involves replacing the existing port authorities with a port operated essentially as a “landlord” – owning the land, but putting out container, management and shipping concessions to competitive tender. However, in view of the different nature of the port issues, these issues are best reviewed in terms of the forthcoming detailed study for the ADB.

4. ISSUES IN FINANCING FUTURE INFRASTRUCTURE

4.1. Overview

154. In the above sections, the Asian crisis is broken into its two “Chinese” components as symbolized in the two Chinese characters on the cover – volatility (danger) and opportunity (future chances). The statistical analysis, both in modeling terms and in the view from the ground, as seen through Project Finance on a non-recourse or limited recourse basis, both confirm the vastness of the opportunities and the extent of the volatility.
155. While there are dangers in making aggregate statements about all of East Asia in the current uncertain climate, some clear themes do emerge.
- The theme of the “new duality” is highlighted – the new roles for government as regulator and structuring agent, moving away from the business management of state enterprises in the key infrastructure sectors.
 - Government needs to upgrade its skills, to form state enterprise reform units with cross-sectoral expertise and generally to move towards competitive tendering for well defined infrastructure projects.
156. Government sectors focused on achieving best practice through private sector participation in an environment in which governance is greatly improved will enable Asia to move towards the dramatic investment projections which are suggested if the region is to return to its impressive growth path. However, the substantial economic growth Asia has achieved has been in ways that are far from best practice, and are wasteful in terms of capital, suggesting that Asia can do better in future. Water concessions, contestable power generators trading with customers across an independent grid, tendered toll road and transport projects, unbundled ports and communications facilities - these innovations are both preferred and feasible outcomes over the years to 2005 – the projection period used in this Report.
157. However, whether these projections are achievable depends critically on the private fund managers’ appetite for the political and currency risk which is inherent in infrastructure projects in East Asia, so long as domestic capital markets are thin and unable to lend substantial funds over long periods of time. The high savings rates of Asia will no doubt continue, making such capital market growth a possibility. But there needs to be far more by way of genuine capital market and financial governance reform before many will be convinced.
158. While ODA assistance, and the international development banks such as the ADB have a key role to play in facilitating loan guarantees, political risk mitigation and taking strategic equity positions, the scale of this activity, while potentially large in absolute terms, and with great sectoral implications if wisely allocated, is nevertheless small when set against the US\$100 billion

appetite for project funding. But, of course, there is no need for the ADB or the World Bank to be active and major lenders – far more important that they take a catalytic role, focused on risk mitigation and the promotion of sound governance, thereby attracting private sector funds on the vast scale required.

159. The booming high technology economy of the US, the improved infrastructure performance and governance situation in South America and the uneven but potentially substantial prosperity in Europe all mean that investors have many choices. Choosing Asian infrastructure projects will continue to be a risk, but also a major opportunity, given the scope for income growth, the 3 billion plus customers and the capacity to rapidly learn from this crisis experience. By far the most important message is that most economies need to focus on:
- ✓ the reform of governance arrangements;
 - ✓ the development of reform units;
 - ✓ the formation of independent regulatory agencies; and
 - ✓ well defined and often unbundled projects.
160. It would be a sad outcome if no lessons were learnt from the currency crisis. After all, as illustrated on the cover, there are two characters for the English word *crisis* in Chinese, which can be translated as *volatility* and *opportunity*. The Asian markets have certainly had enough experience of the former, but how ready are they to seek future opportunities to improve practice and ultimately to lead to a more stable and predictable environment? This is, after all, what is needed if medium and long-term infrastructure goals are to be met.
161. Financing of infrastructure investment is typically more involved than other sectors. Participants tend to be associated with projects for longer and in a more detailed way. The outcome is much more dependent on the ability of the individual parties to work together to solve key risk issues. Opportunity now exists to re-educate or re-direct parties involved in the project business and to re-examine the framework upon which the development process takes place.
162. Opportunities abound for each party to the infrastructure process. This is set against the requirement for individual projects to satisfy appropriate risk reward parities. The inability to adequately cover these risks in the present environment will prevent many projects from progressing and will increase the cost of those that do manage completion. It is not a contention however that the world financing markets have insufficient volumes to fund appropriate projects in Asia. Rather, the success of Asian projects depends on their relative attractiveness when compared to other investment opportunities around the globe. If the right risk reward balance is struck, capital investment flows will follow.
163. The above argument of course assumes that the currency crisis will eventually stabilize and provide a healthy backdrop for development. The sections above show a marked correlation between the extent of the crisis and the effect on

individual projects. Similarly, a return to stability will result in a renewal of development. This correlation will not however be as great as the first one. Investors and credit providers will be acutely aware not to repeat the painful process that they have just been through. After all, the fall out to banks of the crisis in terms of bad debts is large. Banks will take time to recover themselves and in some cases will have to merge in order to do so. They will need convincing not just of the macro economic outlook, but much more that individual countries will apply the best possible practice in the development process. The focus of global asset allocators will be much more on the individual project rather than using the project as a proxy for investment in the future growth of the economy and its associated demand levels.

164. The basis for sound development of the infrastructure sector is already laid out in the World Development Report 1994. Manage infrastructure like a business, introduce competition, give users and stakeholders voice and responsibility, engage the public and private sectors and involve governments in creating policy and regulatory frameworks. In many ways, it could be argued that all participants in the infrastructure sector need to pay close attention to these sort of recommendations. However, the crisis has also provided an opportunity to see how best to communicate these recommendations and how to improve upon them. Ultimately, the goal must be best practice as opposed to the minimum standards required to achieve a successful project.
165. In line with using projects as a proxy for the discussion of quantitative investment measures, discussion in this section is limited to project infrastructure.

4.2. *Government Opportunity*

166. Governments have the strength to influence the outcome of post-crisis financing in a variety of situations. Best practices have not yet been achieved in most industries and in most countries. Government's role in promoting practices, education and effecting change in order to make the risks of individual projects more transparent and ultimately more attractive. Key areas in which Governments can participate have been subject of a number of previous reports and are summarized below.
- Promotion of political and fiscal stability.
 - Restructuring of utility sectors, including the unbundling of existing assets and their sale.
 - The commercialization and corporatization.
 - The removal of subsidies.
 - Imposition of clear contractual frameworks and enforcement of non-discriminatory judgements.

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- Establishment of independent regulators with performance standards.
 - Evaluation of public tenders in a transparent and fair manner.
 - Encouragement of foreign participation on a pari passu basis and removal of foreign ownership restrictions.
 - Minimize cross ownership.
 - Support and encouragement of domestic capital markets.
 - Allow repatriation of profits.
 - Encouragement of risk mitigation markets.
167. The commitment of Governments to the above issues needs to be total and at all levels of the administration. This essentially constitutes an involved process which changes attitudes and perceptions at middle levels of the administration. During the UK privatization process initiative the key to effecting change was an educational process conducted by individuals from the private sector, so too in Australia. The same general mechanism should be considered to assist change in Asia.

4.3. Developers and Sponsors

168. Developers often have mixed feelings about private sector funding initiatives. On the positive side, the encouragement of a competitive private sector funded market should increase overall investment flows, which in turn creates a larger set of opportunities for developers than would otherwise be the case. On the other hand, experience to date with private infrastructure projects has been mixed. Some projects have been recognized failures, such as the SES Expressway in Thailand; others have required restructuring such as the Don Muang Tollway, also in Thailand. These examples and the current problems facing developers holding project assets that are not performing as a result of the crisis have led developers to be much more wary.
169. In particular, experience of those developers who bought into projects expecting a certain rate of return has not been what it was first thought. While new projects report returns often in excess of 15%, it is worth remembering that this is an internal rate of return calculation giving an annualized average return. The majority of revenues in most projects arrive at the offices of the shareholders only in the latter years of the project's life. Given many franchise periods of over 25 years, this is a long time to wait. Roads, for example, are notoriously poor in producing initial cash flow such that it may be many years after opening before return on developers' equity becomes positive, as calculated on an annualized basis. In order to realize the percentage gains early on, developers either have to seek a buyer of the project asset or list a portion of it on the equity markets. Either option will not provide the level of returns developers require in the current market. Since each project undertaken by developers involves a large capital commitment,

unrealized expectations have a significant and detrimental effect on the developer's share price. The stakes are high.

170. Developers also face financial "cycle risk". Hopewell's projects for instance needed to span a long period of financial market stability in order to develop each project to the point at which Hopewell was to realize the full gains on invested shareholder funds. In reality the result of a downturn in Asian sentiment led to the recognition that Hopewell was carrying a large amount of development debt on its balance sheet. This was thrown into stark relief as the likelihood of the project portfolio producing cashflow receded. The result was a forced sale of assets. The development of proper process is thus a difficult one to manage, essentially because of the short term expectations of the developer's own shareholders versus the long term and capital intensive nature of the development process itself.
171. The above factors mean that the infrastructure investment process is a risky one for developers to undertake and this will limit the number of competitive developers bidding for any public asset or tendered project. Large international utilities will have a size advantage that will put up a barrier to entry by new competitors. This can't be good for future efficient and effective tender programs. Education of equity markets on the life cycle of developers may help improve the situation and lessen the risk of timing mismatches.
172. All is not lost however for the forlorn developer. Developer manufacturers can set up domestic Asian manufacturing units to produce equipment, such as generators, the cost of which is denominated in local currency. This has the advantage to the developer sponsor of reducing currency risk. This has worked well in some sectors such as power in the PRC. Banks are now comfortable with technology and performance risk for generating units up to and including 300MW that are produced locally. In other industry sectors however, the story is more complicated. Developers are either loath to set up a local manufacturing unit, because of concerns of quality control, or because they wish to retain a manufacturing base in their home country. Whether it is a quality issue or a competitive issue, local manufacture will not be a panacea.

4.4. Financial Institutions and Markets

173. The attitude of the financial markets and the perception of risk is key to the future success of infrastructure development in Asia. No amount of direct domestic Government support or direct funding through aid programs will be sufficient to realize the gains required. The future growth of infrastructure in Asia will be dependent on credit providers taking a positive view of the risks and rewards in Asia when compared to other parts of the globe. Currently, there is a large gap between the amount of finance on offer from markets and institutions and the amount required. What are the reasons for this gap and how can it be closed?
174. First and foremost, the credit market has become much more able to appreciate and manage risk. Professionals are familiar with efficient project structures

and have had good experiences of lending to these in other regions. In this regard, the implementation of best practices is absolutely fundamental to attracting capital flows. Best practice by governments, legal authorities and regulators extends also to those involved in the financial markets. Financiers expect to see the level of transparency and professional reporting usual in developed markets. In the past, Asia has been generally short in meeting the levels of transparency expected. The difficulty in obtaining detailed and accurate information and the traditional secrecy surrounding ownership and operation of assets has created a barrier for credit flows. This barrier will have to be addressed before credit providers will take a positive view of projects and corporations in the market, post-crisis.

175. Disintermediation of the banking markets was a goal outlined for Asia at the beginning of the decade. The prospect of a bond market providing cheaper credit and longer maturities was exciting and led to intensive discussion. Expectations were not met, and even pre-crisis, the bond market's inability to reach the expectations of the project financial community was a concern. There are a number of reasons for this. The main attraction of the bond markets is that they bring the investor market in direct contact with the project. However, bond market parameters are often fixed in respect of the parameters it has for investment and several of these cause potential problems.
176. Bond markets only ever reach full pricing benefits when the market has liquidity. Because of this, new bond issues for projects in Asia ended up being priced at relatively expensive levels, despite the additional maturities they offered. Had the market taken off with the addition of sufficient new issues, bolstered by healthy secondary trading, then pricing of new issues would reduce. Because of the patchy start, the full benefit of the project bond market was not realized.
177. One of the main problems with sourcing bonds is the absence of firm financing commitments. Developers are loath to progress huge infrastructure projects unless they have strong commitments to fund. These commitments are available from the bank market but not from the bond market. Many developers tried to bridge the gap by putting in place committed bank lines which could be replaced by bonds in favorable market conditions. Not surprisingly, banks are not generally content with this arrangement, and neither are ECAs. The recent case of Enron canceling bank and ECA commitments and sourcing bonds for its petrochemical project in the middle east illustrates this. Bond markets will have to overcome this problem of an inability to give underwritten commitments before they become a major funder of Asian projects.
178. Currently, most of the project bond products have to be sourced from either the 144a market or the private placement market in the US. However, well-versed bond buyers are in the US, and so the distance between them and where the project is to be developed inevitably constitutes a barrier. The development of a domestic Asian bond market with depth and liquidity and with the sophistication of its market practitioners and buyers to understand

local risk is paramount if bonds are truly to provide the volumes of financing required.

179. The banking sector has traditionally been most active in the project financing sector. With the high levels of Asian savings mostly directed to deposits with commercial banks, banks have had a strong funding base from which to approach lending. Not all banks, of course, have the same view of infrastructure funding. The majority had both experience in global projects and specialized departments set up to advise and arrange project credits. Others, however, view the asset class negatively. Long maturities and pricing which has reduced over the years have interacted to make seasoned bankers wary. With the onset of the crisis, bankers became even more cautious. If pricing of credit assets is set by the market, the problem of attracting bank credit to a project rests mainly with those issues directly relating to currency risk and maturity.
180. The increasing involvement of some ECAs in funding project credits contrasts with the withdrawal of others. The European and Japanese ECAs have shown strong interest in supporting developers' efforts to make new projects successful. ECGD, Coface and J-exim have led this effort by tailoring existing programs to the requirement of the project. Schemes which offer assumption of project market risk and long maturities have bridged the gap between the commercial bankers in a range of industries and countries. Recently, ECAs have announced plans to restructure repayment profiles to best match the amortizing profile of projects. There is no doubt that the ECAs will continue to play a large role in the financing of projects in Asia, but is the direct funding and assumption of risk in the long term interests of Asia's infrastructure development?
181. In the short term any level of funding will help rekindle Asia. In the medium to long term however, any funding by Government organizations has to be coupled to the implementation of best practices – and this is one reason this Report has included a substantial section on “best practice” issues. In the absence of a shift to best or better practice, with improved and appropriate risk allocations and regulatory reforms, commercial banks and bond markets will be forced to rely on the direct assumption of risk by Government organizations. Interestingly, despite strong pressure from US developers for US Exim to play a role in funding of Asian projects, US Exim has yet to assume significant levels of project risk. While there is no doubt that US developers are at a competitive disadvantage to Europeans or Japanese in the short term as a result, the philosophy of the US will result in fitter companies and fitter markets. It would be nice to believe that ECAs could concentrate on developing best practice in Asia and the development of a competitive market place in much the same way as for the multilateral agencies.
182. Equity markets are generally regarded as more efficient than other financial markets, but recent events have shown how prone Asian markets are to mass psychology. US Federal Reserve Chairman Alan Greenspan put it succinctly in his comments in Fernery after the Asian crisis, to the effect that the fall in

value of the Asian currencies has been to levels that “have no tie to reality”. In the absence of best practice in the financial reporting market, global financial institutions are even more likely to overreact to shocks. Much of this could be mitigated if the Asian market risk was researched and explained to asset buyers in a transparent manner and under independent regulatory controls.

183. Multilateral agencies, such as the ADB, have had a special role in the development of infrastructure financing. This role is set to expand as the ADB is in an excellent position to influence institutions and professionals engaged in the business of infrastructure finance. The potential ways of assisting the development process have been discussed in many forums. Some of the more pertinent issues include:

- encouragement of best practice;
- communication of best practice through training schemes;
- facilitating a fair evaluation process for competitive tenders; and
- promotion of efficient debt capital markets.

184. A number of other aspects are perhaps worth considering. The first of these centers around how institutions can best provide seed capital for projects to ensure that they are progressed in the most competitive manner. One of the more successful schemes was the provision of advisory fees for the BOT Laibin B program. A major sticking point to projects moving ahead in the PRC has been the unwillingness to pay for intellectual capital and to recognize the worth of advisory roles. This is the case even now, despite the fact that the Laibin B program was arguably the most competitive financing in the PRC to date. Most advisers still find it impossible to garner fees in the PRC at the cost of bankers looking to fund such projects. Bankers, masquerading as advisers, will typically offer free or cheaper advisory fees in order to have a privileged role in funding. The impact of this in a competitive process is obvious and problematical.

185. Other problems are worth tackling head on. If the multilateral development banks are to fund projects directly, it can take away the willingness of markets to find a competitive solution. The various ways around this all focus on providing a catalyst to the project funding process. In the light of what is discussed above, this could include:

- the establishment of new infrastructure funds;
- the establishment of political risk funds;
- the exploration of mechanisms to bridge the current financing gap between maturities provided by banks and those required by projects, and to bridge the gap between bond markets and projects in terms of commitments to finance.

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186. Whatever the mix and range of solutions, it is clear that the current crisis should provide insight and opportunity to explore new ways of solving some of the more problematic issues facing the Asian recovery program. The argument is that markets do not return to sound performance by themselves and that Asia will need to continue to explore new ways of attracting global allocations of capital.

4.5. Prospects for Economic Recovery and Renewal of Infrastructure Demand.

187. The extent of the Asian currency crisis and its flow-on effects was predicted by no one, although there were many voices warning of the need to improve governance arrangements and capital market structures, so as to avoid substantial risk exposure and eventual instability. At the time of writing, March 1999, it still takes a brave person to predict the short-term outlook for currencies, or to forecast the short to medium term outlook for the restoration of infrastructure investment in many Asian countries. In part, this is why the focus of this paper is on the long run issues - governance, the role of the private sector in infrastructure and scenarios to the year 2005.
188. There is considerable evidence about how the public and private sectors can and should work together to achieve broad economic benefits. Improved governance and capital market arrangements are key targets for policy, which if seriously promoted, would help restore confidence in Asian economies, confidence which is now lacking.
189. It is acknowledged that free mobility of capital, supplemented by quality information across countries, is a desirable means for allocating capital across competing ends. But this same high mobility can be a problem when the signals to which capital responds are heavily distorted, e.g. by extensive government guarantees, by preferred banking or export finance arrangements, or through government guaranteed take-or-pay contracts or volume and demand guarantees. In general, the solution should be to improve the quality of information and regulation, i.e. governance, rather than to block the competitive functioning of the capital market.
190. However, if capital gets quite different assurances in different countries, if government guarantees of risks are allowed to build up in some countries, despite market access capacity, and if the rules of monetary and capital market policy are unclear, then free mobility of capital may be destabilizing. That said, in the context of poor and misleading signals from government, there is a chance that some new forms of intervention may correct matters. The PRC's relative insulation from the recent swings of capital has provided some evidence in favor of restrictions on capital market freedom, although it could be argued that it is very much a "second best" policy. It is worth recalling that the major international financial institutions, including the IMF, failed to pick the likely depreciation of the Rupiah - on the contrary the macro and current account fundamentals were read as strong.

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191. However, while we present a mixture of evidence from the macro projections and the more sober project finance assessments, this is a positive paper. It argues that the major infrastructure goals, set out in the tables, are attainable in those countries willing to shift to best practice regimes, to measures enabling the deepening of capital markets and to make substantial improvements in governance across the board. Transparency of contracting in particular, needs to become part of the new set of principles that should govern the region.
 192. If the current shakeout moves Asian nations in the “good governance” and best practice direction in terms of public/private partnerships, then the benefits will be enormous. If, on the other hand, the current crisis causes the barriers to trade and capital movements to be raised, then the long term outlook is very much worsened, as there could be a move to “beggar-thy-neighbor” forms of protection which have caused so many problems in decades past.

5. ANNEX - PROJECTIONS OF INFRASTRUCTURE DEVELOPMENT IN EAST ASIA⁹

5.1. Summary

193. This report provides a set of forecasts for infrastructure demand in the East Asia region (the PRC, Indonesia, Korea, Malaysia, the Philippines and Thailand) to the year 2005. The principal objective is to present forecasts that take into account the ongoing financial and economic crises experienced by some countries in the region.
194. The forecasts are based on post-crisis projections for economic growth and estimates of 1995 infrastructure investment.
195. The method used is designed to incorporate efficiency gains in infrastructure capital usage. The efficiency gains are argued to arise from:
- greater reliance on private sector provision and management of infrastructure projects;
 - a general shift to best practice;
 - greater scrutiny of projects by financial markets after recent crises; and
 - more efficient and intensive use of existing infrastructure projects.

These efficiency gains are modelled by the transition of these economies to new lower infrastructure-to-output ratios.

196. A special case (Case 1) of the model assumes a stable relationship between the level of production and the level of infrastructure investment (both public and private). Forecasts for infrastructure demand are then based upon forecasts for production.
197. A more general specification of the model (Case 2 or Case 3) allows the transition of these economies to a new lower infrastructure-to-output ratio. This dynamic flexibility of the general specification of the model is a particularly attractive feature given the recent massive upheaval in many of the economies considered - a stable relationship between infrastructure investment and production is unlikely in the near future.
198. Case 2 is a general specification of our “transition” model, which allows for a 25% increase in efficiency in each of the sectors and the countries considered.

⁹ This Annex has been prepared with the assistance of Dr Kevin Fox, Glen Otto and Graham Voss of the School of Economics, University of NSW, Sydney.

Half of these efficiency gains are assumed to be achieved within five years, starting in 1998. Case 3 differs from Case 2 in that it allows for sector and country specific efficiency gains. The total estimates from these two specifications are very similar, but there can be some sectorial and/or country differences.

199. The resulting infrastructure investment projections are considerably lower than projections based on pre-crisis GDP growth forecasts (simple extrapolations based on 1996 growth rates in the region), due to a combination of lower GDP growth forecasts and assumed improvements in efficiency.
200. A summary of the infrastructure demand in the East Asia region, cumulative over the 1996 – 2005 period, for the countries is set out below. The projected growth scenario uses current (post-crisis) GDP growth forecasts for the period, and the lower growth scenario uses GDP growth forecasts which are lower by a uniform 2% each year:

Projected Growth Scenario 1996-2005

Base Case (no crisis)	US\$1.78 trillion
Case 1 (new growth assumptions)	US\$1.53 trillion
Case 2 (uniform efficiency gains)	US\$1.37 trillion
Case 3 (varying efficiency gains)	US\$1.36 trillion

Lower Growth Scenario 1996-2005

Base Case (no crisis)	US\$1.78 trillion
Case 1 (low growth assumptions)	US\$1.42 trillion
Case 2 (uniform efficiency gains)	US\$1.27 trillion
Case 3 (varying efficiency gains)	US\$1.26 trillion

It should be noted that:

- An important factor in calculating forecasts for this region is the PRC. The PRC accounts for roughly one half of the infrastructure spending for the region and is not forecast to slow in growth. This tempers the reduction in infrastructure demand for the region due to reduced growth.
- There is a greater divergence in results between Case 1 (No Transition Model) and cases 2 and 3 (transition models) when the period 1998-2005 is considered. This is because the transition models allow for possible efficiency gains from 1998 onwards.

- Finally, it should be noted that the quality of these forecasts depends crucially upon (1) the assumed response of public infrastructure requirements to economic growth, (2) the quality of the growth forecasts, and (3) the estimates of the initial investment levels in 1995. As such, the projections should be interpreted with some caution.

5.2. Objective

201. The objective of this part of the Report is to calculate projections for infrastructure demand in the East Asia region for the period 1996–2005.
202. An additional objective is to allow for efficiency gains arising from the potential effects of improved capital usage in the post-crisis period.
203. The countries considered are the PRC, Indonesia, Korea, Malaysia, the Philippines and Thailand, and the sectors are transport, power, telecom, and water and sanitation.

5.3. Methods Used

204. Those with an aversion to Greek or mathematical symbolism may wish to jump straight to the results section below. For the rest, it is suggested that a useful way to think of the methods used is as follows.

CASE 1: NO TRANSITION MODEL

205. Let G denote real infrastructure investment, public or private. Let Y denote real output. Then the model can be expressed as,

$$G / Y = \theta(z)$$

where z is a set of conditioning variables such as urbanization, land area and other variables that might affect the share of infrastructure investment in a country. This relationship gives the growth relationship used in projections,

$$d \ln g = d \ln y$$

holding z constant. (This notion of holding z constant has some problems since it might include some measure such as per capita income which may be changing and also demographic variables which may also be changing.) From the last relationship, projections of the growth in G can be made based upon growth forecasts of Y .

206. Note that this type of relationship is sometimes thought of as one of infrastructure demand or requirements; this is not strictly correct. The above is a reduced form relationship taking into account the demand side (governments, firms and consumers depending upon the nature of

infrastructure) and the supply side (the effect of infrastructure on production, as discussed in, e.g., Aschauer (1989), Otto and Voss (1994) and related literature). The best way to interpret this is as a long-run “great” ratio, without getting too concerned about the interpretation of the parameters.

207. However, this simple model does not appropriately take into account a number of key ideas. These are:

- capital decisions moving to the private sector;
- a general shift to best practice, due to external pressure (from global capital markets, multilaterals like the ADB and the World Bank, and other agencies), for both public and private infrastructure projects; and
- a shift from new investment projects to rehabilitation (that is, more efficient and intensive use of existing capital projects).

208. A simple macroeconomic implication of these ideas is that the share of public investment in output should fall, holding all other factors, z , constant. Some further relevant issues have slightly different implications:

- Higher price of funds to cover risk; this is likely to reduce the number and size of projects funded so that G falls. However, whether this results in a fall in G/Y is not clear since the implications for Y are not known. If the smaller project size and lower number of projects constrains economic growth (as in Aschauer-type models), then the ratio may not change (although this is an argument for lower growth projections). If, on the other hand, the projects are mainly those that directly affect the standard of living (such as water and sanitation after certain levels), then Y may be less affected and G/Y may fall.
- Non-linearities are important in power and telecoms. Here it is not clear what the direct macroeconomic implications are. On the one hand, for large-scale investment projects such as telecom rollouts, it is possible that investment in some countries in the 1970s and 1980s may have already provided sufficient capacity to meet demands for a long period of time. In this case, the relationship between this type of investment and output will not be linear. In fact, one could argue that G/Y will be lower until capacity is reached.¹⁰ This would depend very much on each country’s situation. On the other hand, if there is forward thinking to bring on such large-scale investment projects, it is likely that it will be optimal to construct significant excess capacity. This may argue for an increase in

¹⁰ The fact that large investment projects with increasing returns to scale in production are optimally constructed with excess capacity is a well-established idea in the capital literature.

G/Y , depending on the state of infrastructure in particular economies.

209. Overall, it seems reasonable to present the core of the above arguments as indicating a fall in G/Y ; further, that this fall is likely to be permanent. Therefore, consider

$$G/Y = \theta_1(z) \quad \text{before the structural change, and}$$

$$G/Y = \theta_2(z) \quad \text{after the structural change,}$$

where $\theta_1(z) > \theta_2(z)$. The magnitude of the fall is not clear but it is possible to think in terms of the following. Suppose new capital projects are 15% more efficient; then roughly it is possible to argue that $(1 - 0.15) \cdot \theta_1(z) = \theta_2(z)$.

210. Notice, however, that this alone is insufficient to get any more interesting results immediately, since it is still the case that infrastructure investment is a constant fraction of output and that both will grow at the same rate. What matters, of course, is the transition to the new share level, which is considered now.

A MODEL OF TRANSITION TO BEST PRACTICE (CASES 2 AND 3)

211. Let $x(t) \equiv G(t) / Y(t)$, where t denotes the time period. Further, let the structural change (associated with the recent financial crises) occurs at time 0. Then

$$x(t) = \begin{cases} \theta_1 & t < 0 \\ (\theta_1 - \theta_2)e^{-\gamma t} + \theta_2 & t \geq 0 \end{cases}$$

The limit of this function as t gets large is θ_2 . The rate of decay is given by γ . The half-life (the time it takes to get half way to its new level) is given by $(\ln 2) / \gamma$. By assuming, say, that decay should be rapid and that changes should be in place fast enough to get half way to the new steady state within five years, then $\gamma = 0.14$ is roughly about right.

Now to make this operational, recall that

$$x(t) = G(t) / Y(t)$$

so that

$$\dot{x}(t) / x(t) = \dot{G}(t) / G(t) - \dot{Y}(t) / Y(t),$$

where a dot above a variable denotes the change in that variable between time periods $t-1$ and t . The above equation says that the growth in share of infrastructure in GDP equals the growth in infrastructure less the growth in GDP. With forecasts for the last term; it is possible to compute reasonable

(time dependent) values for the left-hand side from the following formula:

$$\dot{x}(t) / x(t) = \frac{-\gamma(1-\alpha)e^{-\gamma t}}{(1-\alpha)e^{-\gamma t} + \alpha}$$

where $\theta_2 = \alpha\theta_1$, $\alpha < 1$ by assumption. From these two growth rates, it is possible to calculate the implied growth rate for G , which is what is required. Notice that these will be less than previously, since the growth rate of x is less than zero. In summary, the parameters required are α , a measure of the overall gain in efficiency due to the arguments above; γ , the rate of adoption of the new efficiency measures. From these, it is possible to adjust the growth rate relationship between output and infrastructure to allow for the transition forced by the structural change due to the recent currency crises.

5.4. Results

212. Recent forecasts for economic growth for specific countries in the region are used. These forecasts are provided by Macquarie Bank (13 August 1998). These figures are provided in Table 6 (s1), and these are referred to as the projected growth forecasts. The numbers in bold for 1996 and 1997 represent that these are actual GDP estimates, while the numbers in italics for the remaining years are forecasts.
213. In Table 7, the GDP growth forecasts in Table 6 are adjusted for transition effects to get infrastructure growth rates. The results in Table 3 use infrastructure growth rates which are specific to each sector for each country.
214. In order to calculate the estimates, an initial level of infrastructure spending in each country by sector is required. These estimates are calculated by the Asian Development Bank. These numbers correspond to the 1995 infrastructure figures reported in each table.
215. The results are organised as follows:
 1. **Case 1 No Transition Model**; see Table 6.
 2. **Case 2 Transition model**, with $\alpha = 0.75$ and $\gamma = 0.15$; see Table 7.
 3. **Case 3 Transition model**, with specific α 's and $\gamma = 0.15$; see Table 8.
216. Figure 19 plots the total infrastructure forecasts from cases 1 and 2, and a baseline scenario which assumes that output continues to grow at the 1996 growth rate. For clarity, Case 3 is not plotted in Figure 19, as it does not differ substantially from Case 2 in terms of total infrastructure.
217. For completeness, the tables include forecasts for the period 1995-2005. Forecasts for the period of principle interest for the purposes of this report, 1996-2005, are a subset of the longer forecast range. Totals for 1996-2005 are calculated by subtracting the 1995 values from the totals in the tables.

5.5. Results for Case 1 – the “No Transition” Model

218. These estimates assume that an increase in the growth rate of 1% of income translates into a 1% increase in the demand for (combined public and private) infrastructure investment. Another way of thinking about this model is that it is a special case of the transition model described above, i.e., it is the transition model with $\alpha = 1$ (no efficiency gains), and/or $\gamma = 0$ (transition does not start).
219. Two scenarios are reported in Table 6. The first, labelled **s1**, is based on the forecasts discussed above (projected growth scenario). The second, labelled **s2** (lower growth scenario), is a downward revision of the projected growth scenario by 2% in each year for each country.
220. For all countries but China there is a significant decline in investment, as anticipated.
221. Forecasts based on the baseline growth rates, for 1996-2005 for all countries in the sample give a total of US\$1,783 b. For post-crisis forecasts, the projected growth scenario (s1), this model projects US\$1, 532 b; for the lower growth scenario (s2) the model projects US\$1,419 b for the same period.

5.6. Results for Cases 2 and 3 – Transition Models

PRELIMINARY REMARKS

222. To adjust the forecasts because of the transition process discussed above, values for two parameters are required: α , the measure of the overall gain in efficiency in infrastructure projects, and γ is the rate of adoption of new efficiency measures.
223. Based upon discussions with experts in the field, results for $\alpha = 0.75$; i.e. a 25% gain in efficiency are presented. Also, $\gamma = 0.15$; i.e. this implies that one half of the reforms are effected over approximately five years.
224. It is assumed that the efficiency changes commence in 1998.
225. The same growth forecasts as described above are used; further, results for both scenarios as described above are presented.
226. Results using country- and sector-specific values for the efficiency gain parameter α are also presented. Reasonable variation of the efficiency parameter across sectors has little impact on the overall results.

PROJECTIONS

227. As anticipated, the Transition Model projections are substantially lower than those using the No Transition Model. For Case 2 Table 7 under the projected growth scenario (s1), the total level of projected spending on infrastructure in the region for 1996-2005 is US\$1,372 b. This is roughly a fall in projections

by about 10% between Case 1 and Case 2.

228. Under the lower growth scenario the projected spending is US\$1,273 b.
229. For the period after the start of the crisis, 1998-2005, there is a fall in projections by almost 13% between Case 1 and Case 2 under either scenario.
230. The effect on the projections of the transition model is tempered by the strong forecasted growth in China.
231. For Case 3 (Table 8), the total projections are largely unchanged compared with Case 2. However, by allowing the efficiency improvements to differ between the sectors in Case 3, there are differences with Case 2 on a sectorial level. These differences depend on the assumptions made about the relative efficiency improvements across sectors and countries. The following table summarizes the projected efficiency gains for each sector for each country.

α 's	Transport	Power	Telecom	W&S
China	0.8	0.8	0.6	0.8
Indonesia	0.7	0.7	0.6	0.7
Korea	0.7	0.7	0.6	0.7
Malaysia	0.85	0.85	0.6	0.85
Philippines	0.85	0.8	0.6	0.85
Thailand	0.7	0.7	0.6	0.7

Note: α is a measure of the overall efficiency gain, i.e. 0.8 for China in the transport sector implies a 20% efficiency gain. With $\gamma = 0.15$ half of these efficiency gains are realised with five years.

232. In Case 3, as seen from the above table, it is assumed that the telecom sector has the potential for a greater efficiency gain (40% in each country) than the transport or water and sanitation sectors (15-30%, depending on which country is considered). Recall that under the current specification of the transition model, half of these efficiency gains take place within five years.
233. A comparison of cases 2 and 3 at the sectorial level indicates the ability of the model to facilitate the investigation of different scenarios based on expert information regarding possible efficiency changes in different sectors in each of the respective countries.

A Summary of Results

234. A summary of the different models employed is presented in the following table.

Model	α	γ	Growth Estimates
Baseline	1	0	1996 GDP growth rate
Case 1	1	0	GDP growth forecasts
Case 2	0.75	0.15	GDP growth forecasts
Case 3	Varies across countries and sectors	0.15	GDP growth forecasts

Note: $\alpha = 0.75$ implies a 25% efficiency gain, and $\gamma = 0.15$ implies that one half of the reforms are effected over approximately five years. For each case we consider two scenarios, **s1** and **s2**, where **s1** uses the projected growth forecasts and **s2** is a downward revision of these forecasts by 2% in each year for each country.

235. Figure 19 presents a graph comparing the cases 1 and 2. Also, baseline forecasts for the period 1995-2005 based on 1996 GDP growth rates is plotted. Case 3 is not presented due to its similarity with Case 2.

236. Figure 19 makes clear the modelling strategy employed. After transition to new infrastructure-output ratios are established, the growth rates of infrastructure will eventually be the same in cases 1, 2 and 3. The divergence in levels evident in the figure is due to the different assumptions about efficiency gains. These gains are conjectured to arise from the re-organisation of infrastructure capital and an improved response to market incentives that occur in the aftermath of the crisis.

Table 6: Case 1, No Transition Model

PRC Year	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	S2	s1	s2	s1	s2	s1	s2
1995	15.40	15.40	28.00	28.00	20.21	20.21	1.76	1.76	65.37	65.37
1996	16.89	16.89	30.72	30.72	22.17	22.17	1.93	1.93	71.71	71.71
1997	18.38	18.38	33.42	33.42	24.12	24.12	2.10	2.10	78.02	78.02
1998	19.48	19.12	35.42	34.76	25.57	25.09	2.23	2.18	82.70	81.14
1999	20.75	19.98	37.73	36.32	27.23	26.22	2.37	2.28	88.08	84.79
2000	22.20	20.97	40.37	38.14	29.14	27.53	2.54	2.40	94.24	89.03
2001	23.98	22.23	43.60	40.42	31.47	29.18	2.74	2.54	101.78	94.38
2002	26.14	23.79	47.52	43.25	34.30	31.22	2.99	2.72	110.94	100.98
2003	28.49	25.45	51.80	46.28	37.39	33.41	3.26	2.91	120.93	108.05
2004	31.05	27.24	56.46	49.52	40.75	35.74	3.55	3.11	131.81	115.61
2005	33.85	29.14	61.54	52.99	44.42	38.25	3.87	3.33	143.68	123.71
Cum.	256.61	238.60	466.57	433.81	336.76	313.12	29.33	27.27	1089.27	1012.80

Indonesia	Transport		Power		Telecom		W & S		Totals	
	Year	s1	s2	s1	s2	s1	s2	s1	s2	s1
1995	2.14	2.14	4.01	4.01	1.24	1.24	0.31	0.31	7.70	7.70
1996	2.31	2.31	4.33	4.33	1.34	1.34	0.33	0.33	8.32	8.32
1997	2.43	2.43	4.55	4.55	1.41	1.41	0.35	0.35	8.73	8.73
1998	2.06	2.01	3.87	3.77	1.20	1.17	0.30	0.29	7.42	7.25
1999	1.90	1.81	3.56	3.40	1.10	1.05	0.27	0.26	6.83	6.52
2000	1.84	1.72	3.45	3.23	1.07	1.00	0.27	0.25	6.62	6.20
2001	1.88	1.72	3.52	3.23	1.09	1.00	0.27	0.25	6.76	6.20
2002	1.93	1.74	3.62	3.26	1.12	1.01	0.28	0.25	6.96	6.26
2003	2.03	1.79	3.81	3.36	1.18	1.04	0.29	0.26	7.31	6.45
2004	2.13	1.85	4.00	3.46	1.24	1.07	0.31	0.27	7.67	6.64
2005	2.24	1.90	4.20	3.56	1.30	1.10	0.32	0.28	8.06	6.84
Cum.	22.89	21.43	42.90	40.15	13.26	12.42	3.32	3.10	82.37	77.09

Rep. of Korea	Transport		Power		Telecom		W & S		Totals	
	Year	s1	s2	s1	s2	s1	s2	s1	s2	s1
1995	9.34	9.34	7.38	7.38	1.43	1.43	0.28	0.28	18.43	18.43
1996	10.00	10.00	7.90	7.90	1.53	1.53	0.30	0.30	19.74	19.74
1997	10.55	10.55	8.34	8.34	1.62	1.62	0.32	0.32	20.82	20.82
1998	9.92	9.71	7.84	7.67	1.52	1.49	0.30	0.29	19.57	19.16
1999	9.82	9.42	7.76	7.44	1.50	1.44	0.29	0.28	19.38	18.58
2000	10.02	9.42	7.92	7.44	1.53	1.44	0.30	0.28	19.77	18.58
2001	10.32	9.51	8.15	7.52	1.58	1.46	0.31	0.29	20.36	18.77
2002	10.63	9.61	8.40	7.59	1.63	1.47	0.32	0.29	20.97	18.96
2003	11.05	9.80	8.73	7.74	1.69	1.50	0.33	0.29	21.81	19.34
2004	11.49	10.00	9.08	7.90	1.76	1.53	0.34	0.30	22.68	19.72
2005	11.95	10.20	9.45	8.06	1.83	1.56	0.36	0.31	23.59	20.12
Cum.	115.10	107.55	90.95	84.98	17.62	16.47	3.45	3.22	227.12	212.22

Malaysia	Transport		Power		Telecom		W & S		Totals	
	Year	s1	s2	s1	s2	s1	s2	s1	s2	s1
1995	3.03	3.03	3.20	3.20	0.70	0.70	0.28	0.28	7.21	7.21
1996	3.29	3.29	3.48	3.48	0.76	0.76	0.30	0.30	7.83	7.83
1997	3.55	3.55	3.75	3.75	0.82	0.82	0.33	0.33	8.44	8.44
1998	3.41	3.33	3.60	3.52	0.79	0.77	0.31	0.31	8.10	7.93
1999	3.34	3.20	3.52	3.38	0.77	0.74	0.31	0.30	7.94	7.62
2000	3.37	3.17	3.56	3.35	0.78	0.73	0.31	0.29	8.02	7.54
2001	3.47	3.20	3.67	3.38	0.80	0.74	0.32	0.30	8.26	7.62
2002	3.61	3.26	3.81	3.45	0.83	0.75	0.33	0.30	8.59	7.77
2003	3.79	3.36	4.00	3.55	0.88	0.78	0.35	0.31	9.02	8.00
2004	3.98	3.46	4.20	3.66	0.92	0.80	0.37	0.32	9.47	8.24
2005	4.18	3.57	4.41	3.77	0.97	0.82	0.39	0.33	9.95	8.49
Cum.	39.01	36.43	41.20	38.48	9.01	8.42	3.61	3.37	92.84	86.69

Philippines	Transport		Power		Telecom		W & S		Totals	
	Year	s1	s2	s1	s2	s1	s2	s1	s2	s1
1995	1.27	1.27	1.34	1.34	0.45	0.45	0.36	0.36	3.42	3.42
1996	1.34	1.34	1.42	1.42	0.48	0.48	0.38	0.38	3.61	3.61
1997	1.41	1.41	1.49	1.49	0.50	0.50	0.40	0.40	3.80	3.80
1998	1.42	1.40	1.50	1.47	0.50	0.49	0.40	0.40	3.84	3.76
1999	1.45	1.39	1.53	1.47	0.51	0.49	0.41	0.39	3.89	3.74
2000	1.49	1.40	1.57	1.48	0.53	0.50	0.42	0.40	4.01	3.78
2001	1.56	1.45	1.65	1.53	0.55	0.51	0.44	0.41	4.21	3.89
2002	1.64	1.49	1.73	1.57	0.58	0.53	0.47	0.42	4.42	4.01
2003	1.74	1.55	1.84	1.63	0.62	0.55	0.49	0.44	4.69	4.17
2004	1.85	1.61	1.95	1.70	0.65	0.57	0.52	0.46	4.97	4.34
2005	1.96	1.68	2.06	1.77	0.69	0.59	0.55	0.47	5.27	4.51
Cum.	17.13	15.98	18.08	16.86	6.07	5.66	4.86	4.53	46.14	43.04

Thailand	Transport		Power		Telecom		W & S		Totals	
	Year	s1	s2	s1	s2	s1	s2	s1	s2	s1
1995	4.15	4.15	3.41	3.41	1.10	1.10	0.55	0.55	9.21	9.21
1996	4.38	4.38	3.60	3.60	1.16	1.16	0.58	0.58	9.72	9.72
1997	4.20	4.20	3.45	3.45	1.11	1.11	0.56	0.56	9.33	9.33
1998	3.99	3.91	3.28	3.21	1.06	1.04	0.53	0.52	8.86	8.67
1999	3.95	3.79	3.25	3.12	1.05	1.01	0.52	0.50	8.77	8.41
2000	4.03	3.79	3.31	3.12	1.07	1.01	0.53	0.50	8.95	8.41
2001	4.19	3.87	3.45	3.18	1.11	1.03	0.56	0.51	9.31	8.58
2002	4.36	3.94	3.58	3.24	1.16	1.05	0.58	0.52	9.68	8.75
2003	4.58	4.06	3.76	3.34	1.21	1.08	0.61	0.54	10.16	9.02
2004	4.81	4.19	3.95	3.44	1.27	1.11	0.64	0.55	10.67	9.29
2005	5.05	4.31	4.15	3.54	1.34	1.14	0.67	0.57	11.20	9.57
Cum.	47.70	44.59	39.19	36.64	12.64	11.82	6.32	5.91	105.86	98.97

Totals Year	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	35.33	35.33	47.34	47.34	25.13	25.13	3.54	3.54	111.34	111.34
1996	38.22	38.22	51.44	51.44	27.44	27.44	3.83	3.83	120.93	120.93
1997	40.52	40.52	54.99	54.99	29.58	29.58	4.05	4.05	129.15	129.15
1998	40.29	39.48	55.51	54.41	30.63	30.04	4.07	3.99	130.50	127.92
1999	41.20	39.59	57.34	55.12	32.17	30.94	4.18	4.02	134.89	129.67
2000	42.95	40.48	60.18	56.75	34.11	32.20	4.37	4.12	141.61	133.55
2001	45.40	41.98	64.03	59.25	36.60	33.91	4.64	4.29	150.68	139.43
2002	48.31	43.83	68.67	62.36	39.62	36.03	4.96	4.51	161.57	146.73
2003	51.68	46.02	73.94	65.91	42.96	38.35	5.33	4.75	173.92	155.02
2004	55.31	48.34	79.64	69.67	46.59	40.82	5.73	5.01	187.28	163.84
2005	59.22	50.79	85.81	73.68	50.54	43.47	6.16	5.29	201.74	173.23
Cum.	498.45	464.58	698.89	650.92	395.38	367.90	50.88	47.40	1643.60	1530.81

Table 7: Case 2, Transition Model for Each Sector in Each Country
 $\alpha = 0.75$ and $\gamma = 0.15$

PRC	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	15.40	15.40	28.00	28.00	20.21	20.21	1.76	1.76	65.37	65.37
1996	16.89	16.89	30.72	30.72	22.17	22.17	1.93	1.93	71.71	71.71
1997	18.38	18.38	33.42	33.42	24.12	24.12	2.10	2.10	78.02	78.02
1998	18.79	18.43	34.17	33.50	24.66	24.18	2.15	2.11	79.78	78.22
1999	19.39	18.64	35.25	33.89	25.44	24.46	2.22	2.13	82.29	79.12
2000	20.17	19.02	36.67	34.58	26.47	24.96	2.30	2.17	85.61	80.73
2001	21.25	19.66	38.64	35.74	27.89	25.80	2.43	2.25	90.21	83.45
2002	22.67	20.58	41.22	37.42	29.75	27.01	2.59	2.35	96.23	87.35
2003	24.25	21.60	44.09	39.27	31.82	28.35	2.77	2.47	102.93	91.69
2004	26.00	22.72	47.27	41.32	34.12	29.82	2.97	2.60	110.35	96.46
2005	27.93	23.96	50.78	43.56	36.65	31.44	3.19	2.74	118.56	101.70
Cum.	231.12	215.28	420.22	391.42	303.31	282.52	26.41	24.60	981.07	913.82

Indonesia	Transport		Power		Telecom		W & S		Totals	
	Year	s1	s2	s1	s2	s1	s2	s1	s2	s1
1995	2.14	2.14	4.01	4.01	1.24	1.24	0.31	0.31	7.70	7.70
1996	2.31	2.31	4.33	4.33	1.34	1.34	0.33	0.33	8.32	8.32
1997	2.43	2.43	4.55	4.55	1.41	1.41	0.35	0.35	8.73	8.73
1998	1.97	1.92	3.69	3.60	1.14	1.11	0.29	0.28	7.09	6.92
1999	1.75	1.67	3.28	3.12	1.01	0.97	0.25	0.24	6.29	6.00
2000	1.64	1.53	3.08	2.87	0.95	0.89	0.24	0.22	5.91	5.52
2001	1.63	1.49	3.06	2.80	0.95	0.87	0.24	0.22	5.88	5.37
2002	1.64	1.47	3.08	2.76	0.95	0.85	0.24	0.21	5.92	5.30
2003	1.69	1.49	3.17	2.79	0.98	0.86	0.25	0.22	6.09	5.35
2004	1.75	1.51	3.27	2.82	1.01	0.87	0.25	0.22	6.29	5.42
2005	1.81	1.53	3.39	2.86	1.05	0.89	0.26	0.22	6.50	5.50
Cum.	20.77	19.49	38.91	36.52	12.03	11.29	3.01	2.82	74.72	70.13

Rep. of Korea	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	9.34	9.34	7.38	7.38	1.43	1.43	0.28	0.28	18.43	18.43
1996	10.00	10.00	7.90	7.90	1.53	1.53	0.30	0.30	19.74	19.74
1997	10.55	10.55	8.34	8.34	1.62	1.62	0.32	0.32	20.82	20.82
1998	9.52	9.31	7.53	7.36	1.46	1.43	0.29	0.28	18.79	18.38
1999	9.11	8.72	7.20	6.89	1.39	1.34	0.27	0.26	17.98	17.21
2000	9.02	8.46	7.13	6.69	1.38	1.30	0.27	0.25	17.80	16.70
2001	9.06	8.33	7.16	6.58	1.39	1.27	0.27	0.25	17.87	16.43
2002	9.12	8.22	7.20	6.49	1.40	1.26	0.27	0.25	17.99	16.21
2003	9.30	8.21	7.35	6.49	1.42	1.26	0.28	0.25	18.34	16.20
2004	9.50	8.23	7.51	6.50	1.45	1.26	0.28	0.25	18.75	16.24
2005	9.73	8.27	7.69	6.53	1.49	1.27	0.29	0.25	19.20	16.31
Cum.	104.26	97.64	82.38	77.15	15.96	14.95	3.13	2.93	205.72	192.67

Malaysia	Transport		Power		Telecom		W & S		Totals	
	Year	s1	s2	s1	s2	s1	s2	s1	s2	s1
1995	3.03	3.03	3.20	3.20	0.70	0.70	0.28	0.28	7.21	7.21
1996	3.29	3.29	3.48	3.48	0.76	0.76	0.30	0.30	7.83	7.83
1997	3.55	3.55	3.75	3.75	0.82	0.82	0.33	0.33	8.44	8.44
1998	3.27	3.20	3.46	3.38	0.76	0.74	0.30	0.30	7.79	7.62
1999	3.10	2.97	3.27	3.13	0.72	0.69	0.29	0.27	7.37	7.06
2000	3.04	2.85	3.21	3.01	0.70	0.66	0.28	0.26	7.23	6.78
2001	3.05	2.80	3.22	2.96	0.70	0.65	0.28	0.26	7.25	6.67
2002	3.10	2.79	3.27	2.95	0.72	0.65	0.29	0.26	7.37	6.65
2003	3.19	2.82	3.37	2.98	0.74	0.65	0.29	0.26	7.59	6.71
2004	3.29	2.85	3.48	3.01	0.76	0.66	0.30	0.26	7.84	6.79
2005	3.41	2.89	3.60	3.06	0.79	0.67	0.31	0.27	8.10	6.89
Cum.	35.31	33.05	37.29	34.90	8.16	7.63	3.26	3.05	84.02	78.64

Philippines	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	1.27	1.27	1.34	1.34	0.45	0.45	0.36	0.36	3.42	3.42
1996	1.34	1.34	1.42	1.42	0.48	0.48	0.38	0.38	3.61	3.61
1997	1.41	1.41	1.49	1.49	0.50	0.50	0.40	0.40	3.80	3.80
1998	1.37	1.34	1.45	1.42	0.49	0.48	0.39	0.38	3.69	3.62
1999	1.35	1.29	1.42	1.36	0.48	0.46	0.38	0.37	3.63	3.48
2000	1.35	1.27	1.42	1.34	0.48	0.45	0.38	0.36	3.63	3.41
2001	1.38	1.27	1.46	1.34	0.49	0.45	0.39	0.36	3.71	3.42
2002	1.42	1.28	1.49	1.35	0.50	0.45	0.40	0.36	3.81	3.45
2003	1.47	1.31	1.55	1.38	0.52	0.46	0.42	0.37	3.96	3.51
2004	1.53	1.33	1.62	1.41	0.54	0.47	0.43	0.38	4.13	3.59
2005	1.60	1.37	1.69	1.44	0.57	0.48	0.45	0.39	4.31	3.68
Cum.	15.49	14.48	16.35	15.28	5.49	5.13	4.39	4.11	41.72	39.00

Thailand	Transport		Power		Telecom		W & S		Totals	
Year	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	4.15	4.15	3.41	3.41	1.10	1.10	0.55	0.55	9.21	9.21
1996	4.38	4.38	3.60	3.60	1.16	1.16	0.58	0.58	9.72	9.72
1997	4.20	4.20	3.45	3.45	1.11	1.11	0.56	0.56	9.33	9.33
1998	3.84	3.75	3.15	3.08	1.02	0.99	0.51	0.50	8.51	8.33
1999	3.67	3.51	3.01	2.89	0.97	0.93	0.49	0.47	8.14	7.80
2000	3.63	3.41	2.99	2.80	0.96	0.90	0.48	0.45	8.06	7.57
2001	3.68	3.39	3.03	2.78	0.98	0.90	0.49	0.45	8.17	7.52
2002	3.74	3.38	3.08	2.77	0.99	0.90	0.50	0.45	8.31	7.49
2003	3.86	3.41	3.17	2.80	1.02	0.90	0.51	0.45	8.56	7.57
2004	3.98	3.45	3.27	2.84	1.05	0.91	0.53	0.46	8.83	7.66
2005	4.12	3.50	3.38	2.88	1.09	0.93	0.55	0.46	9.13	7.77
Cum.	43.25	40.53	35.54	33.30	11.46	10.74	5.73	5.37	95.98	89.94

Totals	Transport		Power		Telecom		W & S		Totals	
Year	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	35.33	35.33	47.34	47.34	25.13	25.13	3.54	3.54	111.34	111.34
1996	38.22	38.22	51.44	51.44	27.44	27.44	3.83	3.83	120.93	120.93
1997	40.52	40.52	54.99	54.99	29.58	29.58	4.05	4.05	129.15	129.15
1998	38.77	37.96	53.45	52.35	29.52	28.93	3.92	3.84	125.66	123.08
1999	38.36	36.80	53.43	51.29	30.02	28.84	3.90	3.74	125.70	120.66
2000	38.85	36.54	54.49	51.28	30.94	29.15	3.96	3.72	128.24	120.70
2001	40.05	36.94	56.56	52.20	32.39	29.93	4.10	3.78	133.09	122.86
2002	41.69	37.72	59.35	53.74	34.31	31.11	4.29	3.88	139.64	126.45
2003	43.76	38.83	62.70	55.70	36.51	32.48	4.52	4.01	147.48	131.03
2004	46.05	40.10	66.42	57.90	38.94	34.00	4.78	4.16	156.19	136.16
2005	48.59	41.51	70.53	60.33	41.64	35.67	5.06	4.33	165.82	141.84
Cum.	450.20	420.47	630.69	588.57	356.42	332.27	45.93	42.88	1483.23	1384.20

Table 8: Case 3, Transition Model with Country and Sector Specific $(\alpha, \gamma = 0.15)$

PRC Year	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	15.40	15.40	28.00	28.00	20.21	20.21	1.76	1.76	65.37	65.37
1996	16.89	16.89	30.72	30.72	22.17	22.17	1.93	1.93	71.71	71.71
1997	18.38	18.38	33.42	33.42	24.12	24.12	2.10	2.10	78.02	78.02
1998	18.93	18.56	34.42	33.75	24.12	23.64	2.16	2.12	79.64	78.08
1999	19.66	18.91	35.74	34.38	24.37	23.41	2.25	2.16	82.02	78.85
2000	20.57	19.41	37.41	35.29	24.87	23.42	2.35	2.22	85.20	80.33
2001	21.80	20.17	39.63	36.68	25.74	23.78	2.49	2.31	89.66	82.93
2002	23.36	21.22	42.48	38.58	27.03	24.49	2.67	2.43	95.54	86.71
2003	25.10	22.37	45.63	40.67	28.49	25.32	2.87	2.56	102.08	90.92
2004	27.01	23.63	49.11	42.96	30.14	26.28	3.09	2.70	109.34	95.56
2005	29.11	24.99	52.93	45.44	32.00	27.38	3.33	2.86	117.37	100.67
Cum.	236.22	219.94	429.49	399.88	283.26	264.21	27.00	25.14	975.96	909.17

Indonesia	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	2.14	2.14	4.01	4.01	1.24	1.24	0.31	0.31	7.70	7.70
1996	2.31	2.31	4.33	4.33	1.34	1.34	0.33	0.33	8.32	8.32
1997	2.43	2.43	4.55	4.55	1.41	1.41	0.35	0.35	8.73	8.73
1998	1.95	1.91	3.66	3.57	1.11	1.08	0.28	0.28	7.01	6.83
1999	1.72	1.64	3.22	3.07	0.96	0.92	0.25	0.24	6.15	5.86
2000	1.60	1.50	3.01	2.80	0.88	0.82	0.23	0.22	5.73	5.34
2001	1.59	1.45	2.97	2.71	0.86	0.79	0.23	0.21	5.65	5.16
2002	1.59	1.42	2.97	2.66	0.85	0.76	0.23	0.21	5.65	5.05
2003	1.63	1.43	3.05	2.68	0.87	0.76	0.24	0.21	5.78	5.07
2004	1.67	1.44	3.13	2.70	0.88	0.76	0.24	0.21	5.93	5.10
2005	1.72	1.45	3.23	2.72	0.90	0.76	0.25	0.21	6.10	5.15
Cum.	20.35	19.11	38.13	35.81	11.31	10.63	2.95	2.77	72.73	68.31

Rep. of Korea	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	9.34	9.34	7.38	7.38	1.43	1.43	0.28	0.28	18.43	18.43
1996	10.00	10.00	7.90	7.90	1.53	1.53	0.30	0.30	19.74	19.74
1997	10.55	10.55	8.34	8.34	1.62	1.62	0.32	0.32	20.82	20.82
1998	9.45	9.23	7.46	7.30	1.42	1.39	0.28	0.28	18.61	18.20
1999	8.97	8.58	7.09	6.78	1.33	1.27	0.27	0.26	17.65	16.90
2000	8.82	8.27	6.97	6.54	1.29	1.21	0.26	0.25	17.35	16.27
2001	8.80	8.09	6.96	6.39	1.27	1.17	0.26	0.24	17.30	15.89
2002	8.82	7.94	6.97	6.27	1.26	1.13	0.26	0.24	17.31	15.58
2003	8.95	7.90	7.07	6.24	1.26	1.11	0.27	0.24	17.55	15.49
2004	9.11	7.88	7.20	6.23	1.27	1.10	0.27	0.24	17.85	15.44
2005	9.29	7.88	7.34	6.23	1.29	1.09	0.28	0.24	18.20	15.44
Cum.	102.10	95.68	80.68	75.60	14.98	14.05	3.06	2.87	200.82	188.20

Malaysia	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	3.03	3.03	3.20	3.20	0.70	0.70	0.28	0.28	7.21	7.21
1996	3.29	3.29	3.48	3.48	0.76	0.76	0.30	0.30	7.83	7.83
1997	3.55	3.55	3.75	3.75	0.82	0.82	0.33	0.33	8.44	8.44
1998	3.33	3.25	3.51	3.44	0.74	0.72	0.31	0.30	7.88	7.71
1999	3.19	3.06	3.37	3.23	0.68	0.65	0.30	0.28	7.54	7.23
2000	3.17	2.98	3.35	3.14	0.66	0.61	0.29	0.28	7.47	7.01
2001	3.22	2.96	3.40	3.13	0.65	0.59	0.30	0.27	7.56	6.95
2002	3.30	2.98	3.49	3.15	0.65	0.58	0.31	0.28	7.74	6.99
2003	3.43	3.04	3.62	3.21	0.65	0.58	0.32	0.28	8.02	7.10
2004	3.57	3.10	3.77	3.27	0.67	0.58	0.33	0.29	8.33	7.23
2005	3.71	3.16	3.92	3.34	0.68	0.58	0.34	0.29	8.66	7.37
Cum.	36.79	34.40	38.85	36.33	7.65	7.17	3.40	3.18	86.69	81.07

Philippines	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	1.27	1.27	1.34	1.34	0.45	0.45	0.36	0.36	3.42	3.42
1996	1.34	1.34	1.42	1.42	0.48	0.48	0.38	0.38	3.61	3.61
1997	1.41	1.41	1.49	1.49	0.50	0.50	0.40	0.40	3.80	3.80
1998	1.39	1.36	1.46	1.43	0.47	0.46	0.39	0.39	3.72	3.65
1999	1.39	1.33	1.44	1.38	0.46	0.44	0.39	0.38	3.68	3.53
2000	1.40	1.32	1.45	1.37	0.45	0.42	0.40	0.37	3.70	3.48
2001	1.45	1.34	1.49	1.38	0.45	0.41	0.41	0.38	3.81	3.51
2002	1.51	1.36	1.54	1.39	0.45	0.41	0.43	0.39	3.93	3.55
2003	1.58	1.40	1.61	1.43	0.46	0.41	0.45	0.40	4.10	3.64
2004	1.66	1.44	1.68	1.47	0.48	0.41	0.47	0.41	4.29	3.73
2005	1.74	1.49	1.76	1.51	0.49	0.42	0.49	0.42	4.50	3.84
Cum.	16.15	15.08	16.69	15.60	5.14	4.82	4.58	4.28	42.56	39.77

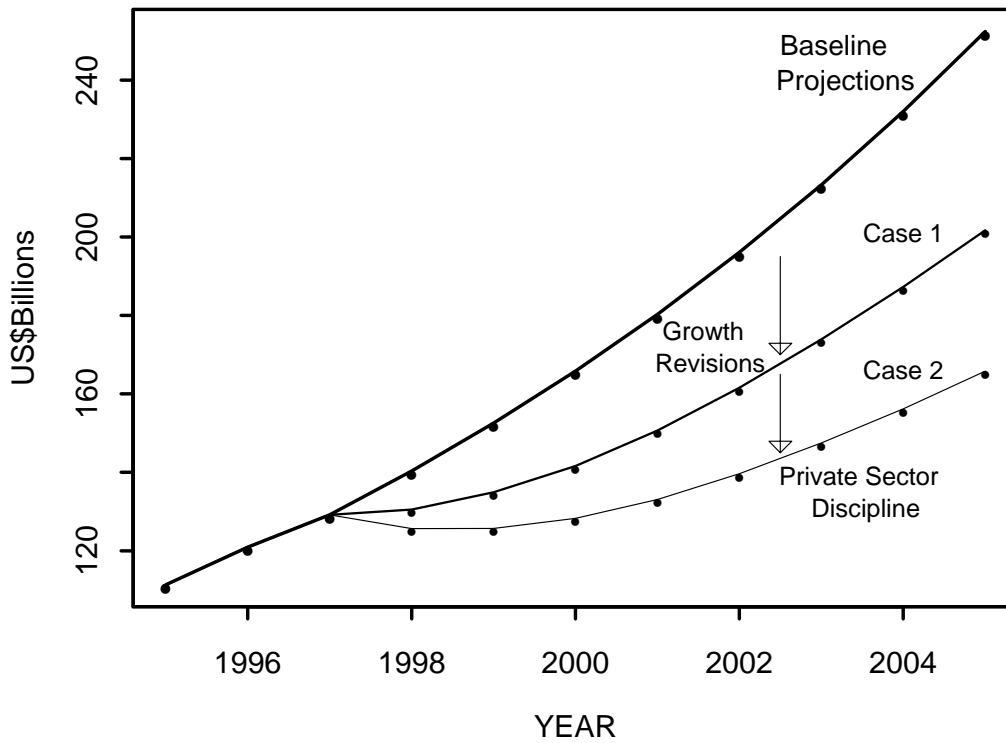
Thailand	Transport		Power		Telecom		W & S		Totals	
	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	4.15	4.15	3.41	3.41	1.10	1.10	0.55	0.55	9.21	9.21
1996	4.38	4.38	3.60	3.60	1.16	1.16	0.58	0.58	9.72	9.72
1997	4.20	4.20	3.45	3.45	1.11	1.11	0.56	0.56	9.33	9.33
1998	3.80	3.72	3.13	3.06	0.99	0.97	0.50	0.49	8.43	8.24
1999	3.61	3.46	2.97	2.84	0.93	0.89	0.48	0.46	7.99	7.64
2000	3.55	3.33	2.92	2.74	0.90	0.84	0.47	0.44	7.84	7.36
2001	3.58	3.29	2.94	2.71	0.90	0.82	0.47	0.44	7.89	7.26
2002	3.62	3.26	2.98	2.68	0.90	0.81	0.48	0.43	7.97	7.18
2003	3.71	3.28	3.05	2.69	0.91	0.80	0.49	0.43	8.16	7.21
2004	3.82	3.30	3.13	2.72	0.92	0.80	0.51	0.44	8.38	7.26
2005	3.93	3.34	3.23	2.74	0.94	0.80	0.52	0.44	8.63	7.33
Cum.	42.36	39.72	34.81	32.64	10.76	10.10	5.61	5.26	93.55	87.73

Totals	Transport		Power		Telecom		W & S		Totals	
Year	s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
1995	35.33	35.33	47.34	47.34	25.13	25.13	3.54	3.54	111.34	111.34
1996	38.22	38.22	51.44	51.44	27.44	27.44	3.83	3.83	120.93	120.93
1997	40.52	40.52	54.99	54.99	29.58	29.58	4.05	4.05	129.15	129.15
1998	38.85	38.04	53.64	52.54	28.86	28.27	3.94	3.86	125.29	122.71
1999	38.54	36.98	53.83	51.68	28.73	27.57	3.93	3.77	125.03	120.01
2000	39.13	36.81	55.11	51.88	29.05	27.33	4.01	3.77	127.29	119.79
2001	40.44	37.31	57.39	52.99	29.87	27.56	4.17	3.85	131.87	121.71
2002	42.20	38.19	60.43	54.74	31.13	28.18	4.38	3.96	138.14	125.07
2003	44.39	39.41	64.03	56.92	32.65	28.98	4.63	4.11	145.70	129.43
2004	46.83	40.79	68.02	59.33	34.37	29.93	4.91	4.28	154.12	134.33
2005	49.52	42.32	72.42	61.99	36.31	31.02	5.21	4.46	163.46	139.80
Cum.	453.97	423.92	638.64	595.85	333.10	310.99	46.60	43.49	1472.30	1374.25

α 's	Transport	Power	Telecom	W&S
China	0.8	0.8	0.6	0.8
Indonesia	0.7	0.7	0.6	0.7
Korea	0.7	0.7	0.6	0.7
Malaysia	0.85	0.85	0.6	0.85
Philippines	0.85	0.8	0.6	0.85
Thailand	0.7	0.7	0.6	0.7

Note: α is a measure of the overall efficiency gain, i.e. 0.8 for the PRC in the transport sector implies a 20% efficiency gain. With $\gamma = 0.15$ half of these efficiency gains are realised within five years.

Figure 19: Comparison of Estimates for Total Infrastructure Investment



Note: The Baseline Projections are the result of considering the case where GDP growth continued at the growth rate for 1995-1996; Case 1 is the No Transition Model (i.e. $\alpha = 1$, or $\gamma = 0$), with the more recent GDP growth forecasts (Table 6) than the Baseline Projections; Case 2 is the transition model with $\alpha = 0.75$ and $\gamma = 0.15$ (Table 7); Case 3 (Table 8) is not plotted as the totals are almost identical to Case 2.

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