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Trends in national and regional investors financing crossborder infrastructure projects in Asia

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Trends in National and Regional Investors Financing Crossborder Infrastructure Projects in Asia

Prabir De, Muthi Samudram,
and Sanjeev Moholkar

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This is a revised version of a background paper prepared for ADB/ADBI's flagship study on infrastructure and regional cooperation and the book *Infrastructure for a Seamless Asia*.

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Abstract

This study examines a range of crossborder infrastructure development issues related to the Asian countries. Despite active pursuit of private investment in infrastructure by most developing countries in Asia and a growing number of success stories, the pace of such investment remains slow. Participation by the private sector in infrastructure development has been mixed. While there has been moderate progress in national infrastructure development by the private sector, progress is rather limited in the case of development of crossborder infrastructure in Asia. This study documents that Asian countries have attracted higher private sector investment for the development of national infrastructure projects such as seaports and airports as compared to crossborder infrastructure projects. The rising trend among private investors in infrastructure projects indicates a decline of investments by developed country investors. One of the findings of this study is that crossborder energy projects have received greater private sector investment globally as compared to transport, telecommunication, and water projects. In the context of Asia, too, energy sector projects still dominate the investment scenario. By considering all modes of financing, this study finds that crossborder infrastructure financing in Asia has witnessed an upward trend in the last decade and a half. Aside from hydropower projects in Bhutan, crossborder infrastructure in Asia is pursued through public-private partnerships. Interestingly, these few crossborder projects in Asia have limited private sector investors, compared to other regions, despite a wide base of local investors in Asia. This paper also shows that public sector investment drives crossborder energy and transportation projects in Asia, whereas private sector investments have picked up the pace only recently, specifically after the 1997 Asian financial crisis. This study recommends that given the huge infrastructure investment needs of the region and insufficient government resources, the role of the private sector and public-private partnerships in enhancing infrastructure facilities in Asia is very crucial. A review of select case studies of crossborder infrastructure projects clearly indicates that the major reasons for slow progress of regional infrastructure development by private sector stem from both economic to non-economic issues that need to be addressed in order to promote seamless Asia.

JEL Classification: F2, F3, G2

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1. INTRODUCTION

Infrastructure has always played a key role in integrating economies across a region. Notwithstanding certain environmental side effects, well-developed and efficient infrastructure facilities are essential for regional economic development and growth. Seen as part of a dynamic concept, infrastructure is a regional public good, moving factors of production within and across regions, thus helping those regions attain higher productivity and growth.

In a regional setting, infrastructure comprises national and international components. Infrastructure that is created and used exclusively for a nation can be termed as national infrastructure, while infrastructure that has crossborder implications[1] is popularly termed as international infrastructure (hereinafter, crossborder infrastructure). While national infrastructure can indirectly enhance regional or international connectivity, crossborder infrastructure enhances international (and regional) connectivity through the exchange of factors of production, trade and investment. For example, transport networks linking neighboring countries enlarge market size, and help national economies to grow. Thus, crossborder infrastructure is seen as one of the major determinants of economic integration processes, especially for land-locked or island countries (Venables 2007). It is often argued that if countries in a region are not interlinked through efficient crossborder infrastructure facilities, their integration process will undoubtedly slow down (Vickerman 2002).[2]

Asia's economic performance in the past few years—particularly in the first half of the ongoing decade—has been commendable on many counts. Economic growth has accelerated and is now averaging over 7% per annum.[3] A fascinating story is unfolding and the entire world is watching with wonder the emergence of Asia as a major economic force. Accompanying this growth is the need for efficient national and international infrastructure services for both production and consumption, and international trade purposes.

Asia needs substantial investment in infrastructure varying between US$165–412 billion (6.2%–7.3% of GDP) per annum for the period 2007–2011. [4] Asia's long-term growth and integration hinges upon the quality and quantity of infrastructure services, both national and international, to be developed in years to come. The widening infrastructure gap between countries is resulting in lower productivity, high transportation and logistics costs, reduced competitiveness, and slower growth. Bridging this gap means overcoming several formidable challenges; some of them, as noted by ADB (2006a), are as follows:

- ***High investment costs.*** For countries to integrate networks seamlessly, expensive programs of shared support and investments are required so as to benefit from crossborder infrastructure.
- ***Uneven distribution of benefits.*** The costs and benefits of regional projects are likely to be distributed unevenly between countries. This often leads to decisions being based on national costs and benefits rather than regional benefits, resulting in insufficient provisions for crossborder infrastructure.

[1] For example, an international airport or seaport which enhances regional or international connectivity.

[2] A vast literature exists on impact of infrastructure on regional integration. One can refer, for example, Brooks and Menon (2008), and ADB-JBIC-WB (2005), among others.

[3] This refers average annual growth rate for the period 2000 to 2006 for ASEAN+4 countries, calculated based on *World Development Indicators 2008*, World Bank.

[4] A vast literature exists on estimation of infrastructure investment needs in Asia in recent years. One can refer, Fay and Yepes (2003), Chatterton and Pureto (2005), ADB-JBIC-WB (2005), ESCAP (2006), RIS (2007), to mention a few.

- ***Financing constraints.*** The public sector is often unable to provide infrastructure because of its weak financial sector, usually marked by underdeveloped long-term capital markets and recurring fiscal concerns. International markets also remain inaccessible to varying degrees because of the higher rates of return that markets expect from such risks associated with investments in the public sector.
- ***Varying regulatory response.*** The varying strengths and weakness of regulatory regimes between countries make regional infrastructure projects difficult to coordinate and develop, particularly in securing private sector financing that requires strong regulation to mitigate risks.

We look ahead at what the challenges are for crossborder infrastructure in Asia, and how to think of approaching them.[5] Given the above, the objective of this paper is two-fold. First, it aims to identify the trends among national and regional investors financing crossborder infrastructure projects (CBIP) that can enhance regional connectivity. Second, it draws lessons from case studies and experiences to enhance regional cooperation in Asia. As a corollary, it also addresses the major constraints for infrastructure financing (including public and mixed investment, as well as private investment) in selected crossborder infrastructure projects in Asia.[6]

The paper is organized as follows: Section 2 discusses trends in crossborder infrastructure projects across the world by region and sector. This section deals with private sector investments in crossborder infrastructure, and the nature and types of investments driven by the private sector. Section 3 focuses on trends in crossborder transportation and energy infrastructure in Asia through different modes of financing. One of the reasons for selecting crossborder transportation and energy projects is that energy sector projects are driven by market demand and are better suited for principal commercial investment while transport projects usually have to be justified on the broader economic benefits (beyond commercial benefits). Discussion on these two types of crossborder projects is immensely important for private sector financing. Section 4 then presents selected case studies of CBIPs in Asia and evaluates their results. Section 5 presents the crossborder infrastructure development strategy in South America. Finally, Section 6 presents policy recommendations for enhancing Asian regional connectivity through CBIPs.

2. TRENDS IN PRIVATE SECTOR INVESTMENTS IN CROSSBORDER

2.1 Infrastructure Projects

The last decade and a half witnessed a sharp decline in official development aid for infrastructure projects in developing Asia (Kirkpatrick and Parker 2004; Jones 2006). In contrast, private capital flows for infrastructure have increased significantly in the same period in response to the general trend towards privatization of infrastructure in developing countries.

From 1984 to 2006, private sector investment (PSI) for global national and crossborder infrastructure projects amounted to US$1.1 trillion (Table 1). The Latin America and Caribbean region (LAC) ranked first, accounting for a 40% (US$443.22 billion) share of global PSI (Figure 1(a)). The Asia and Pacific (AP) and Europe and Central Asia (ECA) regions followed with investments of US$343.63 billion (31%) and US$206.48 billion (19%), respectively.

[5] This has been argued by ADB in many of their seminal publications and RCI activities. Refer, for example, ADB (2006b).

[6] While dealing with crossborder infrastructure projects, we follow the definition of crossborder infrastructure, provided by ADB/ADBI (reproduced in Appendix 1).

The upsurge in investment in infrastructure has been driven mainly by telecommunications (US$536.30 billion). However, investment varies across regions. For example, PSI in the AP region has been driven by the energy sector (US$127.69 billion), whereas it is telecommunications that has attracted majority of the PSI in the other regions.

Although private sector investment in both national and crossborder infrastructure has increased in the last decade and a half, its growth has been uneven and has fluctuated across regions. Global PSI was higher in the 1990s, compared to first half of the ongoing decade (Figure 2), a trend that was much influenced by the AP and LAC regions. In contrast, the ECA, Middle East and North Africa (MENA) and Sub-Saharan Africa (SSA) regions have attracted higher PSIs in infrastructure development during 2001–2006 as compared to 1991–2000. Nevertheless, the trend in PSI in infrastructure development across regions has been rising, except for ECA, where the trend has decelerated in recent years.[7]

Table 1: Private Sector Investments (PSI) in Infrastructure: 1984–2006*

Sector	Region	Total PSI	Crossborder PSI	Share of Crossborder PSI**
		(US$ billion)		(%)
Energy	East Asia and Pacific	98.36	1.25	1.28
	Europe and Central Asia	43.76	1.70	3.88
	Latin America and Caribbean	133.39	5.05	3.79
	Middle East and North Africa	17.47	2.30	13.16
	South Asia	29.34	0.00	0.00
	Sub-Saharan Africa	7.65	1.79	23.40
	Total	**329.97**	**12.09**	**3.67**
Transport	East Asia and Pacific	69.98	0.00	0.00
	Europe and Central Asia	14.91	0.00	0.00
	Latin America and Caribbean	76.18	0.03	0.04
	Middle East and North Africa	3.00	0.00	0.00
	South Asia	13.82	0.00	0.00
	Sub-Saharan Africa	10.04	0.95	9.45
	Total	**187.94**	**0.98**	**0.52**
Telecommunications	East Asia and Pacific	61.91	0.00	0.00
	Europe and Central Asia	142.50	0.00	0.00
	Latin America and Caribbean	218.57	0.00	0.00
	Middle East and North Africa	31.03	0.00	0.00
	South Asia	50.25	0.00	0.00
	Sub-Saharan Africa	32.04	0.00	0.00
	Total	**536.30**	**0.00**	**0.00**
Water	East Asia and Pacific	19.72	0.00	0.00
	Europe and Central Asia	5.30	0.00	0.00
	Latin America and Caribbean	15.08	0.00	0.00
	Middle East and North Africa	1.08	0.00	0.00
	South Asia	0.26	0.00	0.00
	Sub-Saharan Africa	0.26	0.00	0.00
	Total	**41.69**	**0.00**	**0.00**
	Grand total	**1,095.90**	**13.08**	**1.19**

Notes: *Investment refers cumulative investments for the period 1984–2006 in US$ billion. **In terms of total PSI.

Source: Calculated based on World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org

[7] See, Appendix 2 (a) which provides the year-wise trend in PSI and Appendix 2(b) the same by regions.

Compared to investments in infrastructure overall, however, PSI in crossborder infrastructure has been very low. From 1991 to 2006, only 1.36% of cumulative investment in infrastructure (US$13.08 billion) went into crossborder infrastructure, mainly in energy and transport (Table 1). The distribution of cumulative PSI in crossborder infrastructure across sectors has also been unbalanced. As shown in Table 1, energy alone has attracted 92.43% of total crossborder investments from the private sector (US$12.09 billion). Private participation in energy has increased presumably as a result of technological developments that have reduced the minimum size for efficient power plants, along with user-friendly financing mechanisms that have reduced the risks associated with the projects.

The annual investment for development of crossborder infrastructure has also been inconsistent across the world. It reached a peak of US$3.75 billion in 1998, and thereafter shrunk to less than US$500 million in 2006 (Figure 3). Cumulative PSI in crossborder infrastructure was almost double during the 1990s (US$9.13 billion), when compared with the first half of the ongoing decade (US$3.95 billion).[8]

Figure 1(a): Distribution of Private Sector Investment in Infrastructure by Region

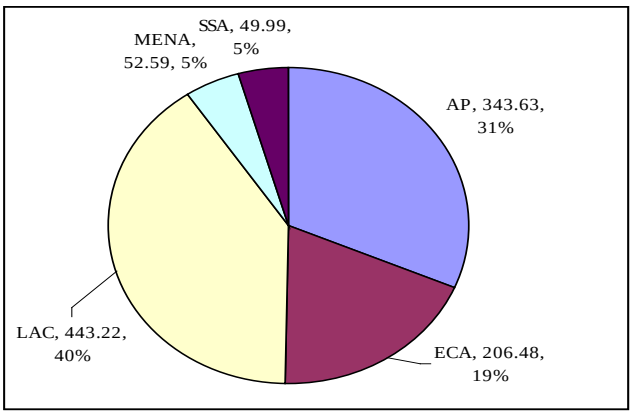
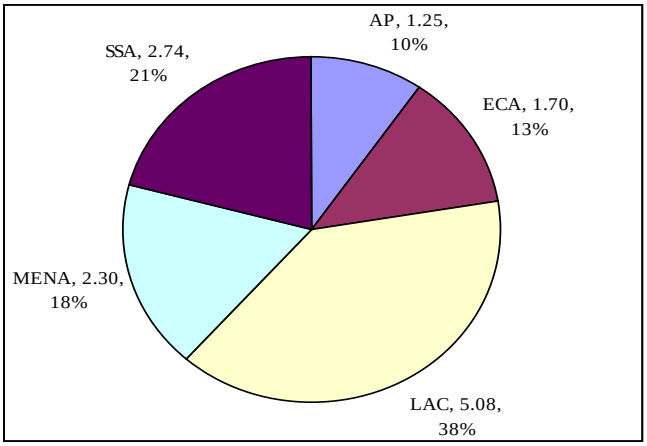


Figure 1(b): Distribution of Crossborder Private Sector Investment in Infrastructure by Region

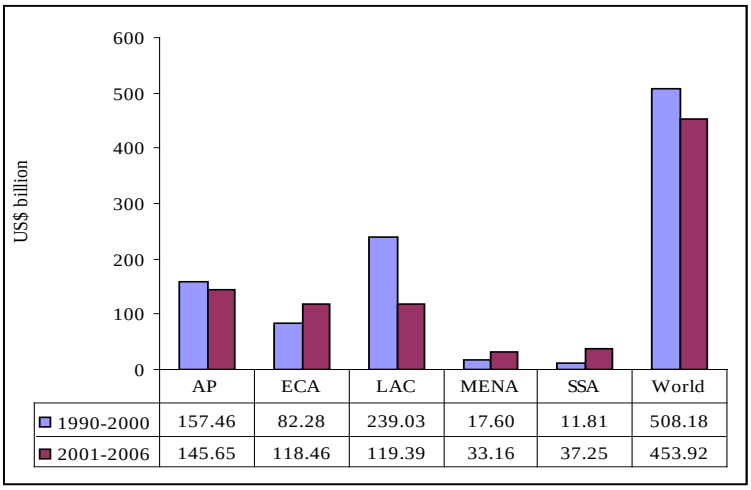


AP = Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and Caribbean, MENA = Middle East and North Africa, SSA = Sub-Saharan Africa

Source of Figure 1(a, b): Calculated based on World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org

[8] Refer to Appendix 2(a).

Figure 2: Private Sector Investment in Infrastructure

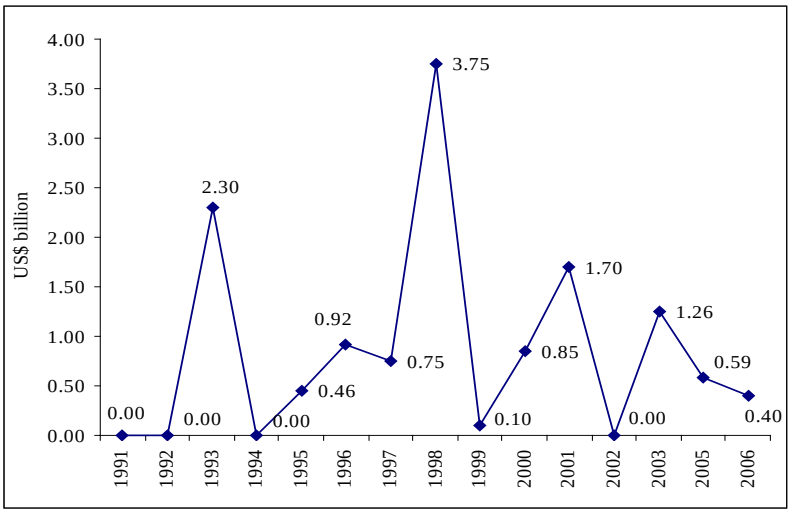


	AP	ECA	LAC	MENA	SSA	World
1990-2000	157.46	82.28	239.03	17.60	11.81	508.18
2001-2006	145.65	118.46	119.39	33.16	37.25	453.92

AP = Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and Caribbean, MENA = Middle East and North Africa, SSA = Sub-Saharan Africa

Source: Calculated based on World Bank Private Participation in Infrastructure (PPI) Database, available at http://ppi.worldbank.org

Figure 3: Year-Wise Trend in Private Sector Investment in Crossborder Infrastructure



Source: Calculated based on World Bank's Private Participation in Infrastructure database, available at http://ppi.worldbank.org

The LAC region has been relatively successful in attracting as much as 38% (US$5.08 billion) of global crossborder infrastructure investment for the period 1984–2007 (Figure 1(b)).[9] With US$2.74 billion of investment, the SSA region comes next, where PSI in energy and transportation have been comparatively balanced. In contrast, PSI in the AP region has been very low with only 13% (US$1.25 billion) of total crossborder investment by the private sector, thus showing the region's challenges with respect to CBIPs.

[9] Refer Appendix 3 (a, b) which provides region-wise crossborder infrastructure.

Table 2: Private Sector Investment in Crossborder Infrastructure by Sector and Region: 1984–2007

Sector	AP	ECA	LAC	MENA	SSA	Total
	(US$ million)					
Natural Gas	719.00	1,700.00	4,370.00	2,300.00	1,790.00	10,879.00
Electricity	535.50	0.00	1,530.00	0.00	0.00	2,065.50
Railroads	0.00	0.00	0.00	0.00	522.70	522.70
Roads	0.00	0.00	32.00	0.00	426.00	458.00
Total	1,254.50	1,700.00	5,932.00	2,300.00	2,738.70	13,925.20

AP = Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and Caribbean, MENA = Middle East and North Africa, SSA = Sub-Saharan Africa

Note: Investment refers to cumulative investments for the period 1984–2007 in US$ million.

Source: Calculated based on World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org

Projects related to natural gas (plant and transmission) have attracted nearly US$10.88 billion of investment (Table 2), indicating that crossborder infrastructure projects in the private domain are mostly driven by energy sector. With US$2.07 billion of private sector investments, electricity comes next. In terms of ranking, the AP region appears last in the league, where PSI has been restricted only to crossborder natural gas and electricity projects. It is seen that natural gas and electricity projects have the advantage of better revenue-generating potential in comparison to transport sector projects. Power projects that are driven by market demand thus have low revenue-generating risks, while transport projects have to be justified in economic terms and have higher revenue risks.

Private infrastructure projects have taken a number of forms, i.e., management and lease contracts, concessions, greenfield projects, and divestitures, of which greenfield projects have gained most in popularity.[10] Greenfield crossborder projects have been largely developed in the energy sector (Table 3(a)), whereas concession remains the preferred mode for crossborder PSI in the transportation sector. The build, own, and operate (BOO) format has been the most preferred project structure for energy PSI (54.6%), whereas miscellaneous arrangements, such as rehabilitate, operate, and transfer; or build, rehabilitate, operate, and transfer; or rehabilitate, lease or rent, and transfer, accounted for 96.7% of transport PSI (Table 4(b)). Much of the private investment in electricity has been in greenfield projects with independent power producers implementing BOO or build, operate, transfer (BOT) contracts. About 28.9% and 16.54% of cumulative investments in the energy sector has been invested in crossborder projects implemented under BOO and Merchant categories. Unlike SSA, the AP region has witnessed a dissimilar trend in types of investment. During 1991–2006, greenfield projects, with an investment of US$1.25 billion, accounted for all the private sector investments in the AP region, of which public-private partnerships (PPP) were implemented under BOT or BOO routes.

Table 3(a): Types of Crossborder Private Sector Investment

	Energy	Transport
	(US$ million)	
Greenfield	12,094.50	32.00
Concession	0.00	948.70
Total	12,094.50	980.70

[10] A greenfield project allows a private entity or a public-private joint venture builds and operates a new facility for the period specified in the project contract. The facility may return to the public sector at the end of the contract period, or may remain in private ownership

Table 3(b): Project Structures of Crossborder Private Sector Investment

	Energy		Transport	
	Investment (US$ million)	Share (%)	Investment (US$ million)	Share (%)
BOT	3,495.50	28.90	32.00	3.26
BOO	6,599.00	54.56	0.00	0.00
Merchant	2,000.00	16.54	0.00	0.00
Misc.*	0.00	0.00	948.70	96.74
Total	12,094.50	100.00	980.70	100.00

Note: *Rehabilitate, operate, and transfer, or build, rehabilitate, operate, and transfer, or rehabilitate, lease or rent, and transfer

Source: Calculated based on World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org

Finally, the AP region has attracted about 31% of global PSI (US$343.63 billion) in infrastructure, next to Latin America, where the crossborder component has been only 0.5%, amounting to US$1.25 billion. Given this low volume of private investment in crossborder infrastructure projects, the AP region ranked last among the five regions considered in this study.

3. TRENDS IN PRIVATE SECTOR INVESTMENT IN CROSSBORDER

3.1 Infrastructure Projects in Asia

An essential requirement for regional cooperation and sustainable development is the provision of efficient, reliable, and affordable crossborder infrastructure services, such as power, transport, and telecommunications. Private participation in infrastructure is no longer a business dominated by investors from the developed world. Firms from developing countries mobilized 44% of private funds for projects reaching financial closure in 1998–2006 (Shurm et al 2008).[11] At the same time, a large number of developing countries have introduced some private participation into their crossborder infrastructure services, especially telecommunications, and, to a lesser degree, electricity and transportation.

Given the rapid growth of regional economic activities, trade, and investment in Asia, crossborder infrastructure has become an important building block of regional integration in the era of globalization (Kuroda et al. 2007). In Asia, development of crossborder infrastructure, especially transportation networks and energy pipelines, is underway, and is expected to contribute significantly to regional integration by reducing transportation costs and facilitating intra-regional trade and services.

There are many causes behind the recent surge in private investment in infrastructure. Among the most important are the inefficiencies of public service provision, the need for economic pricing and cost recovery, technological advances enabling greater private participation, advances in regulatory frameworks, the need for private resources, and the potential investment gap that countries face. Therefore, the role of the private sector in financing and supporting crossborder infrastructure facilities is paramount. However, given the growing demand for national and international infrastructure in Asia, the private sector, whether via PSI or PPP, is expected to play a much greater role in bridging the infrastructure gap and for sustaining economic growth in the region. Here, we discuss the trends in private

[11] There were also changes in the list of the 10 most active sponsors (ranked by investment). Only 3 of the top 10 sponsors in 1990–2000 were still among the top 10 in 2001–2006, and 4 of the top 10 were developing country investors (de Mästle and Izaguirre 2008).

sector investment in both national[12] and crossborder infrastructure projects, which offer direct and indirect implications for the Asian integration process.

3.2 Private Investors in International Airports and Seaports in Asia

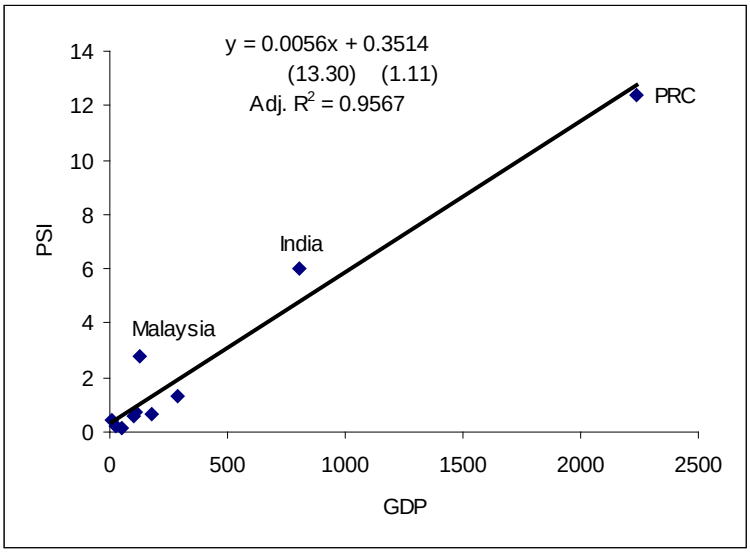
Ideally, international airports and seaports offer crossborder services. About 33% of total private sector investment in transportation infrastructure from 1991 to 2006, amounting to US$25.37 billion, went into seaports and airports in Asia. There is a positive correlation between the size of an economy and the private sector investment it has attracted for national infrastructure that has crossborder implications. Larger economies such as the People's Republic of China (PRC) and India attracted higher PSI for airports and seaports from 1991 to 2006 than did smaller economies (Figure 4). The PRC has attracted US$12.41 billion of private investment in airports and seaports, accounting for 34.44% of total PSI in transport infrastructure in the last decade and a half in that country. India and Malaysia trail the PRC with investments of US$6.02 billion and US$2.82 billion in airports and seaports, respectively (Table 5). Unlike the PRC and India, Malaysia's share of PSI in seaports and airports, as a percentage of total PSI in transport infrastructure, has been relatively low (17.72%). Private sector investment in airports and seaports in other Asian countries, such as Viet Nam, Pakistan, Sri Lanka, and Myanmar, has been very low. Whatever PSI went into the transportation infrastructure in these countries is driven by international airports or seaports only.

There has been some replacement of developed country investors by local investors in Asia. The US$25.37 billion PSI in airports and seaports in Asia from 1991 to 2006 drew from several private sector investors that were concentrated in Asia (Figure 5(a, b)).[13] If we exclude downstream investors, Malaysia ranked first with 15 private sector investors in airports and seaports. A few airports and seaports in Asia have also been funded by investors from the rest of the world. However, their presence is much smaller compared to Asian investors.

[12] We only consider national infrastructure which has crossborder implications.

[13] See Appendix 4 for list of private sector investors in airports and seaports in Asia. This does not consider private sector investors in downstream.

Figure 4: Relationship between Size of the Economy and Private Sector Investment in Asia



Notes: *Figures in parentheses are t-values. The t-value of estimated gross domestic product (GDP) coefficient is significant at 1% level. **Both GDP and private sector investment (PSI) are taken at current US$ billion.

Sources: GDP taken from World Bank World Development Indicators CD-ROM 2007, while PSI was estimated from the World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org

Table 4: Private Sector Investment in Transport Infrastructure in Asia*

Country	Transport Investment	Airports and Seaports# Investment	Share+
	(US$ billion)		(%)
Cambodia	0.45	0.43	97.04
The PRC	36.03	12.41	34.44
India	12.84	6.02	46.89
Indonesia	4.11	1.30	31.61
Malaysia	15.90	2.82	17.72
Myanmar	0.05	0.05	100.00
Pakistan	0.74	0.74	100.00
Philippines	2.21	0.60	26.89
Sri Lanka	0.24	0.24	100.00
Thailand	4.43	0.65	14.77
Viet Nam	0.12	0.12	100.00
Total	**77.11**	**25.37**	**32.90**

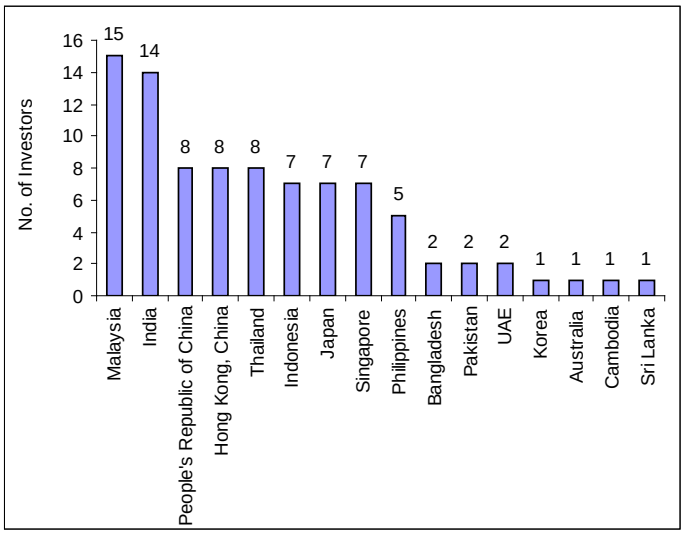
PRC = People's Republic of China.

Notes: *Cumulative investment for the period 1991 to 2006. #Consider only international seaports and airports. +In terms of investment in transport sector.

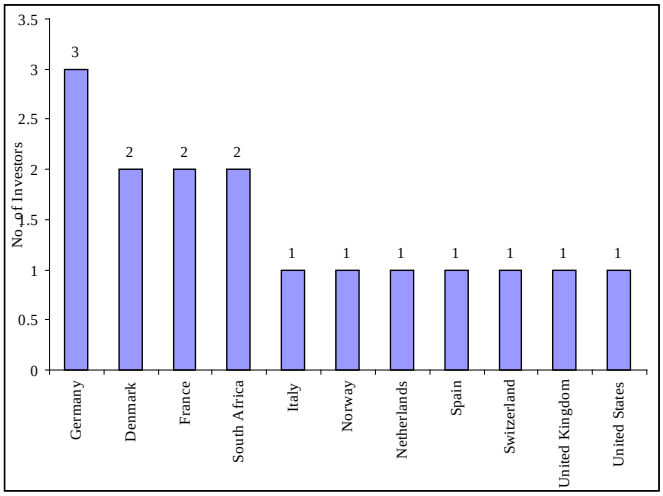
Source: Calculated based on World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org

Figure 5: Private Sector Investors in Airports and Seaports in Asia*

(a) Asian Investors



(b) Other Investors



Note: * This series considers investors for cumulative investment for the period 1991 to 2006 in international seaports and airports.

Source: Calculated based on World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org

3.3 Private Investors in Energy Crossborder Infrastructure in Asia

According to the World Bank Private Participation in Infrastructure (PPI) database, Asia attracted about US$121.3 billion PSI in energy from 1991 to 2006. This was essentially driven by larger economies like the PRC (US$34.85 billion), India (US$17.99 billion), and Malaysia (US$14.31 billion). As shown in Table 5, about 1% of total energy PSI (US$1.26 billion) in Asia went into crossborder infrastructure. Regarding CBIPs in Asia, Bhutan and the Laotian People's Democratic Republic (Lao PDR) have attracted private investors in hydropower, while Myanmar, Indonesia, Malaysia, Thailand, and Singapore have attracted private investors (and also public sector investors and government) in natural gas transmission. Table 6 provides a list of private sector investors in a few completed CBIPs in the Greater Mekong Subregion (GMS). The two prominent hydropower projects, namely, Houay Ho Hydro Power and Theun Hinboun Hydro Power, were developed in Lao PDR in the last decade as greenfield build, own, operate, and transfer (BOOT) projects, where almost 95% of generated power is exported to neighboring Thailand. The two Myanmar–Thailand natural gas transmission projects, namely, Yadana Gas and Yetagun Gas, were set

up in Myanmar in the last decade for exporting natural gas to Thailand. All four projects have been operating successfully. The number of private investors in these four projects in GMS has so far been limited to 10, where these investments were also accompanied by five public sector investors as minor shareholders (Table 6). These GMS crossborder infrastructure projects have attracted investments from Nippon Oil of Japan, PETRONAS of Malaysia, Total SA and SUEZ of France, and Unocal of USA, among others.

Table 5: PSI in Energy Infrastructure in Asia*

Country	Energy	Crossborder Energy	
	Investment	Investment	Share#
	US$ billion	US$ billion	%
Afghanistan	0.002	0.000	0.000
Bangladesh	1.056	0.000	0.000
Cambodia	0.231	0.000	0.000
The PRC	34.847	0.000	0.000
India	17.978	0.000	0.000
Indonesia	11.680	0.000	0.000
Lao PDR	**2.586**	**0.536**	**21.00**
Malaysia	14.313	0.000	0.000
Myanmar	**0.719**	**0.719**	**100.00**
Nepal	0.269	0.000	0.000
Pakistan	6.738	0.000	0.000
Philippines	15.463	0.000	0.000
Sri Lanka	0.463	0.000	0.000
Thailand	12.244	0.000	0.000
Viet Nam	2.715	0.000	0.000
Total	**121.304**	**1.255**	**1.035**

PRC = People's Republic of China.

Notes: *Cumulative investment for the period 1991 to 2006. #In terms of investment in energy sector

Source: Calculated based on World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org

One should also remember that while investors from developed countries (mostly non-Asian in origin) are the main sponsors of an increasing percentage of projects, they have still been declining over recent years in terms of the absolute number and value of projects in which they have participated. In contrast, decline in investment by developed country investors has been replaced to a marginal extent by Asian investors. Thus, investors from Asian countries are now more willing to play a larger role in infrastructure projects.

Table 6: Private Sector Investment in Completed Crossborder Energy Infrastructure Projects in Greater Mekong Subregion

Country	Project	Investment year	Project name	Location	Investment* (US$ million)	Type of PSI	Subtype of PSI	Investors
Lao PDR–Thailand	Electricity generation (Hydro), (126 MW)	1996	Houay Ho Hydro Power	Lao PDR	220.00	Greenfield project	BOT	SUEZ Energy, France; EdL, Lao PDR; HHTC, Thailand.
Thailand–Lao PDR	Electricity generation (Hydro), (210 MW)	1996	Theun Hinboun Hydro Power	Lao PDR	315.50	Greenfield project	BOT	GMS Power, Thai; Nordic Power, Sweden; Statkraft, Norway; Vattenfall, Sweden; EdL, Lao PDR; MDX Lao, Lao PDR.
Myanmar–Thailand	Natural gas transmission (412 km)	1995	Yadana Gas** Pipeline	Myanmar	394.00	Greenfield project	BOO	Total SA, France; Unocal, USA; MOGE, Myanmar; PTT, Thailand.
Thailand–Myanmar	Natural gas transmission (277 km)	1997	Yetagun Gas** Pipeline	Myanmar	325.00	Greenfield project	BOO	Nippon Oil, Japan; PETRONAS, Malaysia; PTT, Thailand; MOGE, Myanmar.
Total					1,254.00			

Notes: *Cumulative investments **Cost for laying pipelines only

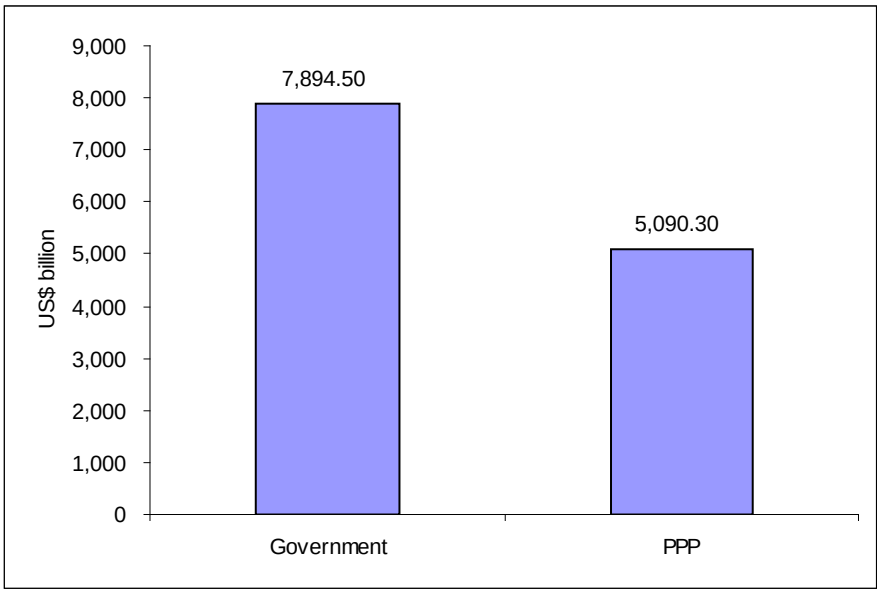
Sources: 1. Calculated based on World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org. 2. ADB GMS Projects Outline, ADB, available at http://www.adb.org/GMS

3.4 Asian Crossborder Infrastructure Projects by all Modes of Financing

The analysis above considered only private sector investments in national and crossborder infrastructure. However, figures for investment in crossborder infrastructure increase if other forms of investment, such as government, PPP and mixed, are also considered.

Crossborder infrastructure financing (all modes) has seen an upward trend in the last decade and a half in Asia. As shown in Table 7, there are six crossborder hydropower projects, of which five are already commissioned and one is under construction; eight crossborder natural gas transmission projects, all in Association of Southeast Asian Nations (ASEAN); three crossborder overland transportation projects, all in GMS (under construction); and one sea bridge connecting Malaysia with Singapore. All these projects have attracted about US$13 billion over time, mostly financed through PPP.

Figure 6: Investment in Crossborder Infrastructure in Asia: 1991 to 2007



PPP = public private partnerships.

Source: Calculated based on Table 7.

Investment in crossborder infrastructure shows a wide variation across subregions in Asia. For example, while transport crossborder infrastructure and gas pipelines are concentrated in GMS and ASEAN respectively, the rest of Asia has yet to witness any major development in crossborder infrastructure, save for a few energy projects between India and Bhutan. The US$13 billion investment in crossborder infrastructure in Asia also indicates three interesting features. First, government investment in crossborder infrastructure is higher than PPP investments (Figure 6). Second, to a lesser extent, it may be said that both public and private investment in crossborder infrastructure in Asia picked up after the 1997 Asian financial crisis. For example, cumulative investment increased from less than US$500 million till 1997 to US$12.52 billion from 1997 to 2007. Third, the growth in investment in crossborder infrastructure is mainly driven by the energy sector projects.

Table 7: Crossborder Investment Projects by all Modes of Financing in Asia

Sector	Sub-sector	Project	Country pair	Year#	Investment (US$ mln.)	Investment Type	Status
Energy	Hydro power	Chukha, Bhutan	Bhutan–India	1988	200.00	Government	Completed
Energy	Hydro power	Kurichhu, Bhutan		2002	119.00	Government	Completed
Energy	Hydro power	Tala, Bhutan		2007	812.00	Government*	Completed
Energy	Hydro power	Nam Theun 2, Lao PDR	Lao PDR–Thailand	2005	1,450.00	PPP	Ongoing
Energy	Hydro power	Theun Hinboun, Lao PDR		1998	240.30	PPP	Completed
Energy	Hydro power	Houay Ho, Lao PDR		1999	220.00	PPP	Completed
Energy	Natural gas	Myanmar–Thailand Gas Pipeline (Yadana Gas Pipeline)	Myanmar–Thailand	1999	394.00	PPP	Completed
Energy	Natural gas	Myanmar–Thailand Gas Pipeline (Yetagun Gas Pipeline)		2000	325.00	PPP	Completed
Energy	Natural gas	Indonesia (West Natuna)–Singapore Gas Pipeline I	Indonesia–Singapore	1999	387.00	PPP	Completed
Energy	Natural gas	Indonesia (South Sumatra)–Singapore Gas Pipeline II		2003	420.00	PPP	Completed
Energy	Natural gas	Malaysia–Singapore Gas Pipeline I	Malaysia–Singapore	1991	260.00	PPP	Completed
Energy	Natural gas	Malaysia–Singapore Gas Pipeline II		2006	17.00	PPP	Completed
Energy	Natural gas	Malaysia–Thailand (JDA) Gas Pipeline	Malaysia–Thailand	2005	565.00	PPP	Completed
Energy	Natural gas	Indonesia (West Natuna)–Malaysia (Duyong) Gas Pipeline	Indonesia–Malaysia	2001	22.00	PPP	Completed
Transport	Road	East–West Transport Corridor	GMS	1999	716.00	Government+	Ongoing
Transport	Road	Southern Transport Corridor		2001	1,331.30	Government+	Ongoing
Transport	Road	North–South Transport Corridor		2003	4,716.20	Government+	Ongoing
Transport	Bridge**	Malaysia–Singapore 2nd Link	Malaysia–Singapore	1998	790.00	PPP	Completed
		Total			**12,984.80**		

PPP = Public private partnership.

Notes: *PSP / PPP in downstream including US$62 million power transmission under PPP. **Includes second crossing bridge, a Customs, Immigration and Quarantine complex, 3 toll plazas, 2 rest and service areas and other ancillary facilities. #Year of operation, except for ongoing projects, for which, we have taken as year of financial closure. +Having substantial multilateral funding.

Data sources: World Bank Private Participation in Infrastructure database, available at http://ppi.worldbank.org; ADB GMS Development Matrix Database, available at http://www.adb.org/GMS/devt-matrix.asp; ASEAN Centre for Energy Database, available at http://www.aseanenergy.org; and Ministry of Power, Government of India, available at http://www.powermin.nic.in

In view of all the foregoing, it may be concluded that crossborder infrastructure financing has witnessed an upward trend in the last decade and a half in Asia. Barring hydropower projects in Bhutan, crossborder infrastructure in Asia is normally pursued through PPP, where energy sector projects are relatively higher in numbers. Interestingly, these few crossborder projects in Asia have limited presence of private sector investors, compared to other regions. Nonetheless, Asian countries have attracted higher private sector investments for development of national infrastructure projects like seaports and airports, compared to crossborder infrastructure projects in the past.

This accumulated anecdotal evidence also suggests that Asian investors have improved their position and are taking on a larger share of infrastructure investments that promote regional connectivity. There are three possible reasons for this: first, the broadening and deepening of capital markets in Asian countries has enabled their investors to mobilize more resources; second, the growing experience of investors with infrastructure investments, often as minority partners with developed country investors, has given them more expertise; and, third, Asian investors might well be in a better position to understand and therefore deal with the political economy issues that stem from privately supported Asian infrastructure projects.

Given the huge infrastructure investment needs of the Asian region and insufficient government resources, the role of the PSI and PPPs in enhancing Asian infrastructure facilities, particularly crossborder infrastructure, is thus very important. At the same time, Asia has very many active local investors, some of whom have been engaged in CBIPs. We look at the trends of these investors in some selected CBIPs next.

4. CROSSBORDER INVESTMENT PROJECTS IN ASIA: REVIEW OF SELECTED CASE STUDIES

We cite here a few examples among several of ongoing and/or completed CBIPs in Asia and critically evaluate their performance in the context of crossborder infrastructure development and regional cooperation.[14]

4.1 Theun Hinboun Hydropower, Lao PDR

The Theun Hinboun project (originally known as Nam Theun 1-2) was the first BOOT Hydropower project implemented in Lao PDR. Construction started in 1994 and the plant was made operational in 1998. The 210 MW (2x105 MW) project is located about 100 km upstream of the confluence of the Mekong river. A 230 kV transmission line (86 km long) was also constructed to transport electricity from the station to the Thailand border.

The main objective of the project was to support economic growth in Lao PDR by enhancing foreign exchange earnings through the export of electric power to Thailand. This was the first project implemented under the 1993 memorandum of understanding between Lao PDR and Thailand for developing 1,500 MW of power in Lao PDR by the year 2000 for export to Thailand. It was the first major investment under the new foreign investment policy of Lao PDR. In addition to technical assistance for structuring legal agreements for implementation of the project, the Asian Development Bank (ADB) also extended loan assistance for the project.

The final project cost, including foreign and local currencies was US$240.3 million. The project was completed on time, without delays, and with substantial savings from the original estimated cost.

[14] We only consider case studies of some successful CBIPs here; a few more are listed in Appendix 6.

4.1.1 Implementation Arrangement

In 1994, the Government of Lao PDR formed a PPP, named Theun-Hinboun Power Company Ltd. (THPC), to plan, design, finance, construct, own, operate, and maintain the project, and sell electricity under a long-term contract to the Electricity Generating Authority of Thailand (EGAT).

The Government of Lao PDR was represented by Electricité du Laos (EdL), the state-owned power utility, while the private sector was represented by the foreign sponsors MDX Lao Public Company Ltd. (MDX) and Nordic Hydropower AB (NH). The MDX is 90%-owned by GMS Power Public Company Limited; the remaining 10% is owned by the Crown Property Bureau, Thailand. The NH is equally owned by Statkraft A.S. of Norway and Vattenfall AB of Sweden.

From the beginning, since the legal framework in Lao PDR was inadequate for the project to be implemented under a commercial format, the Government of Lao PDR and THPC entered into a License Agreement (LA) that authorized THPC to implement the project on a BOOT basis for 30 years (from the start of commercial operation). The LA contained provisions on exclusive rights and tax and royalty obligations of THPC. THPC was also protected under the LA against any water diversions detrimental to it, except for the implementation of the NT2 Project. In return, THPC was required to pay a royalty of 5% of gross revenue to the Government. THPC was granted a tax holiday of five years commencing with the start of commercial operations up to the end of 2002, after which THPC was expected to pay 15% tax on its taxable income. The Lao PDR Government took responsibility for environmental and social mitigation; funding for such mitigation measures and compensation, however, was to be provided by THPC (limited to US$2.6 million).

The Power Purchase Agreement (PPA) was executed between EdL and EGAT in June 1996 with a validation period of 25 years from the start of commercial operations. The PPA provided for an option to renegotiate the tariff after 10 years and was based on the take-or-pay principle under which EGAT undertakes to purchase 95% of the project's available energy output. The tariff itself was denominated in dollars, of which 50% was to be payable in dollars and 50% in Thai baht at the exchange rate on the execution date of the PPA. In the first year of operation, the tariff was negotiated at US$0.0484 per kWh and would increase thereafter at a fixed rate of 1% per annum.

4.1.2 Financing Arrangement

Equity funding of US$110 million was raised by the Government of Lao PDR, through EdL (US$66 million), MDX (US$22 million) and NH (US$22 million). On the other hand, debt funding worth US$130.3 million was provided by the Government of Lao PDR (US$6.9 million), commercial banks (US$64.8 million) and through export credit (US$58.6 million).

Funding towards the Government of Lao PDR's contribution for the project was channelized through grant assistance from Norwegian Agency for Development Cooperation (US$7.1 million) and UNDP (US$0.4 million); and loan assistance from ADB (US$57.7 million) and Nordic Development Fund (US$7.3 million).

The ADB loan was extended to the Government of Lao PDR at a 1% interest rate, with 40 years maturity and a 10-year grace period. The ADB funds were further on-lent by the Government of Lao PDR to EdL (US$5.5 million, at 6.21% interest, with 25 years maturity and 5 years grace period) and THPC (US$8.5 million, at 10% interest, with 16 years maturity and 4 years grace period).

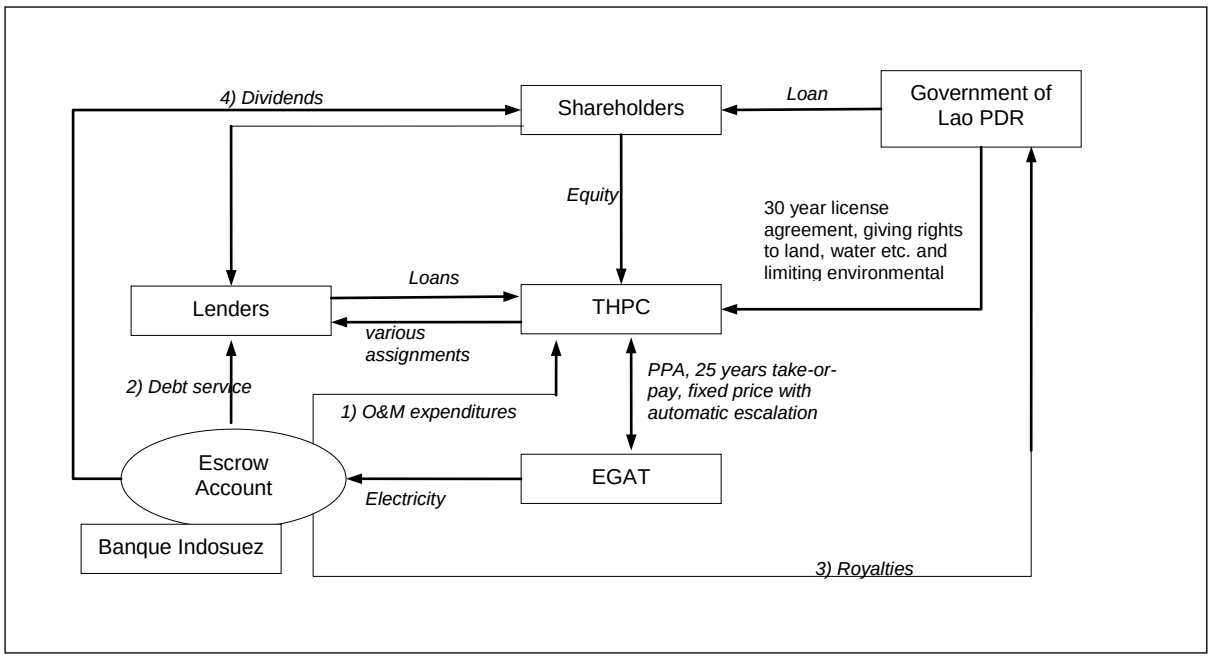
4.1.3 Financial Returns

According to ADB (2000), THPC's financial performance was found to be exceptional. The project was rated as highly profitable with substantial accumulated net profits during operating years. The analysis showed that during the period 1998–2009, total revenues and

net income from the project would reach US$736.6 million and US$407.6 million, respectively. After paying dividends to shareholders, THPC would still retain US$13.8 million in unappropriated earnings. On the other hand, the shareholders are projected to recover their investment through dividend payments. By 2009, virtually all debt will have been paid and profitability will depend on tariff negotiations with EGAT and whether EGAT moves to a pooling system. Financial analysis shows that THPC's recalculated financial international rate of return (FIRR) was 19.5% (project life of 25 years). Further, it was found that over the period 1998–2000, EdL would earn about US$46.4 million and the income was projected to reach about US$28.6 million per annum till the year 2022.

A recent ADB publication (ADB 2007) has mentioned that THPC's sales revenues increased from US$42 million in 1998 to US$57 million in 2005, and are expected to reach about US$55 million in the future. THPC is making a healthy profit and maintains a comfortable debt-servicing capacity. The project generated net income of US$88 million from 2003 to 2005. THPC's dividend payments over 2003–2005 amounted to US$78 million, of which US$47 million went to EdL. In addition THPC paid about US$2.8 million in royalties to the government in 2005. The profit tax payment for 2004 was about US$3.4 million and about US$2.9 million for 2005.

Figure 7: Financing Structure of Theun-Hinboun Project



Source: Authors.

4.1.4 Mitigation of Project Risks

The project risks were mitigated to a large extent through a number of initiatives from the project sponsors (UNCTAD 2005). The Government of Lao PDR committed to meet its obligations under the 30-year BOOT license, while the ADB waived its usual negative pledge covenant. The shareholders gave a completion guarantee to the lenders.

As shown in Figure 7, an offshore escrow account, managed by a French bank, was set up and pledged to the lenders. Funds were distributed, first to meet the O&M costs of THPC, then to service the debt to the lenders, followed by royalties to the government, and later, dividends to shareholders. O&M costs are managed via a contract awarded every three years. In addition, Lao PDR agreed to join the World Bank Group's Multilateral Investment Guarantee Agency (MIGA), which allowed the lenders to take out sovereign risk insurance with MIGA.

4.1.5 Project Benefits

THPC was expected to contribute about US$21.2 million revenue in the year 2000; that would increase to US$40.9 million by the year 2022. In the real sense, the project was found to have favorable impact on Lao PDR's economy through export of electricity to Thailand and rural electrification in the surrounding areas. Substantial employment was generated during the construction period and in plant operation. The project also resulted in capacity building of several workers associated with the project. Further, availability of modern education and medical services has resulted in improved living conditions in the area. With substantial funds earned from the project, the EdL is in a position to subsidize electricity tariffs for the poor population in the country and support its various power projects.

On the negative side, project-related environment and social impacts were found to be a serious issue when flows were diverted to the Nam Hai–Nam Hinboun system. However, the risks were largely mitigated with support from ADB in the form of review missions and technical assistance.

Overall, the project was found to be remarkably successful with respect to financing arrangements, project implementation, and coordination between all parties concerned.

5. NAM THEUN 2 HYDROPOWER, LAO PDR

5.1 Location

The 1,075 MW Nam Theun 2 (NT2) hydropower project is a trans-basin scheme being developed via the diversion of the flow of the Nam Theun river from the Nakai plateau down to the Xe Bang Fai river. It comprises 4 x 250 MW units designed for the supply of power to Thailand and 2 x 37.5 MW units for Lao PDR domestic power consumption. The project also includes a 138 km long 500 kV transmission line from the power station to Thailand border near Savannakhet.

In terms of financing, NT2 is the largest private sector crossborder project, as well as being the largest private sector hydropower scheme, in Southeast Asia. Construction was started immediately after financial closure in June 2005. The project has been constructed at an estimated cost of US$1.45 billion (Table 8). The official handover of the project to the Lao PDR Government is planned for June 2010.[15]

5.2 Implementation Arrangement

The project is being implemented by Nam Theun 2 Power Company Limited (NTPC), a company incorporated under the laws of Lao PDR and mandated through a BOOT concession agreement to build, own, operate, and transfer the project to the Government of Lao PDR at the end of the 25-year operation period.

The shareholders of NTPC comprise EDF International (EDFI), a subsidiary of Electricité de France (35%); Lao Holding State Enterprise (LHSE), a company fully owned by the Government of the Lao PDR (25%); Electricity Generating Public Company Limited (EGCO) of Thailand (25%); and the Italian-Thai Development Public Company Limited (ITD) of Thailand (15%).

The concession agreement for implementation of NT2 was executed between NTPC and Government of Lao PDR in 2002. Under the terms of the 30-year concession agreement, of which the operating period is 25 years, NTPC has full responsibility for timely completion of project. The main construction activities are contracted under a turnkey contract to EDF. The NTPC and Government of Lao PDR have joint responsibility for implementation of

[15] Refer to http://www.namtheun2.com/index.php?option=com_content&view=article&id=98&Itemid=112.

resettlement and social development activities. In case of defaults, termination rights have been provided to both parties.

The PPA was executed between NTPC and EGAT and Electricité de France in 2003. Unlike the Theun Hinboun project, the PPA is based on the take-or-pay principle under which 95% of the project's energy would be sold to Thailand for the first 13 years, and later subject to a spot market, if operated. The energy tariff has been built on system avoided cost[16] in Thailand.

Table 8: Financing Structure of Nam Theun 2

Project Financing Plan	US$ million	Thai Baht million	Total (US$ million)*	% of total
Long-term Debt	**500.00**	**20,000.00**	**1,000.00**	**69.0%**
ECA–COFACE (France)	136.00		136.00	9.4%
ECA–EKN (Sweden)	29.00		29.00	2.0%
ECA–GIEK (Norway)	35.00		35.00	2.4%
IDA PRG	42.00		42.00	2.9%
ADB OCR	50.00		50.00	3.4%
ADB PRG	42.00		42.00	2.9%
MIGA PRG	42.00		42.00	2.9%
AFD (Agence Française de Dévelopment)	30.00		30.00	2.1%
NIB (Nordic Investment Bank)	34.00		34.00	2.3%
PROPARCO facility	30.00		30.00	2.1%
Thai Exim Facility	30.00		30.00	2.1%
Thai commercial Bank Facility (7 Banks)		20,000.00	500.00	34.5%
Equity	**445.24**	**190.54**	**450.00**	**31.0%**
Private Equity	332.74	190.54	337.50	23.3%
GOL–ADB Loan	16.10		16.10	1.1%
GOL–AFD Grant	6.20		6.20	0.4%
GOL–EIB Loan	41.00		41.00	2.8%
GOL–IDA Grant	20.00		20.00	1.4%
GOL's Contribution	29.20		29.20	2.0%
Total	**945.24**	**20,190.54**	**1,450.00**	**100.0%**

Notes: *Converted at 1US$= THB 40.

Source: ADB (2007).

5.3 Financing Arrangement

Equity contribution of nearly 31% of project cost has been made by the shareholders and debt funding of about 69% has been raised from international financial institutions (IFIs), commercial banks/lenders. A combination of financial institutions, comprising 5 multilateral, 4 export credit, 2 bilateral and 16 Thai and international commercial banks, are involved with financing of the project.

The World Bank has provided a Partial Risk Guarantee loan under International Development Association (IDA) (US$42 million), and MIGA has extended a guarantee for debt (US$42 million), while ADB has extended a Political Risk guarantee (US$42 million). The World Bank has also provided IDA grant assistance (US$20 million), and ADB has extended loan assistance (US$50 million) and a public sector loan (US$16.1 million) to the Government of Lao PDR.

[16] System avoided cost is the marginal cost of the same volume of energy that Thailand should have acquired or generated by other sources such as fuel, gas and coal taking least cost plan into account. Under this principle, the cost of energy generated by a Lao project shall be lower than the Thai system avoided cost. Difference between Thai System Avoided Cost and Lao Generation Cost will be shared by EGAT and IPP owner.

In addition, nine international commercial banks (ANZ, BNP Paribas, BOTM, Calyon, Fortis Bank, ING, KBC, SG, and Standard Chartered) and seven Thai commercial banks (Bangkok Bank, Bank of Ayudhya, Kasikorn Bank, Krung Thai Bank, Siam City Bank, Siam Commercial Bank, and Thai Military Bank) are providing long-term loans to NTPC. The equity contribution of LHSE (one of the shareholders of NTPC) is financed through loans, grants, and other tools by AFD, ADB, European Investment Bank, and the World Bank.

5.3.1 Mitigation of Project Risks

Some of the major issues related to private sector participation in crossborder infrastructure projects are the political, contractual, and legal risks associated with such projects. As noted above, these risks have been appropriately addressed by the international funding agencies. The NT2 is a classic case of PPP with limited recourse financing, ably supported by international funding agencies, export credit agencies, and multiple commercial lenders.

Learning from shortcomings from the Theun Hinboun Hydropower project, the NT2 has been carefully designed, with adequate planning for economic, environmental, and social safeguards that are extensively monitored by internationally recognized and independent panels, project lenders, and IFIs. The safeguards were designed in consultation with local villagers and under international guidelines and recommendations from the various financial institutions involved with the project. These measures are fully funded as part of the project cost and cover the entire project area including catchment reservoir and downstream areas. As it is based on the take-or-pay principle, revenue risks for the project are minimal. A 5-year tax holiday followed by 10% and 15% corporate profit tax during the next 5-year period applies to the project.

5.3.2 Expected Project Benefits

Given the relatively small size of the national economy, the project is expected to have significant economic impacts in Lao PDR.[17] The project will generate considerable revenue through taxes, royalties, and dividends for the government, and this revenue can be effectively ploughed back to provide necessary public goods and services required for sustainable growth and poverty reduction. The Government of Lao PDR, via the revenue to be generated from the project, is planning to establish a poverty reduction fund with the objective to promote economic and social development throughout the country.

It is expected that the NT2 could lead to doubling in private investments (IMF, 2003) during the construction period. Construction activities are providing job opportunities to nearly 4,000 workers in the neighborhood and local areas. All these effects are expected to boost the economic growth of Lao PDR from the current 6% to nearly 7% up to 2011. In addition, availability of additional electricity from the power station and better access due to about 140 km of new or upgraded roads under this project would improve the living condition of the population in the adjoining areas.

Revenues generated from the project will provide substantial funding for the government's National Growth and Poverty Eradication programs. The NT2 project would help the Lao PDR economy grow at higher rate in coming years, which would lead to higher personal incomes and per capita consumption, thereby bringing economic well-being and reducing poverty in Lao PDR.

5.4 East–West Economic Corridor in the Greater Mekong Subregion

With an eye toward addressing their mutual development needs, the GMS countries adopted a program of economic cooperation with assistance from ADB in 1992. The program was

[17] See, for example, ADB (2005a), *Macro-economic Impacts of the Nam Theun 2 Project*, Manila, February

conceived to create an integrated, prosperous, and equitable Mekong subregion, complementing individual national efforts to promote economic growth and reduce poverty. In 2001, the GMS countries endorsed a 10-year strategic framework targeting enhanced connectivity, increased competitiveness, and a greater sense of community in the region. About 11 flagship projects were identified, out of which the North-South Economic Corridor (NSEC), East-West Economic Corridor (EWEC), and Southern Economic Corridor (SEC) dominated the GMS transport sector plan. The corridors were planned to encourage trade, investment, and tourism, and ease crossborder movement of people and goods in the subregion and were intended to serve about 2.6 million sq. km. of surface area and nearly 320 million people.

Out of the several flagship programs, the EWEC is in the most advanced stage of completion, and several transport, energy, telecommunications, industrial, tourism, and other programs have been successfully launched or are under implementation. Most of these projects are being funded through public resources, and private participation is limited. The case study of EWEC has been included to appreciate the catalytic role played initially by the government and donor agencies in funding basic infrastructure, which, in turn, attracts the private sector to develop other economic infrastructure in the subregion.

The EWEC flagship initiative focuses on transport (road, water, railway, and airports), energy, telecommunications, tourism, and other initiatives with the intent to further strengthen economic cooperation, and facilitate trade, investment, and development along the East–West transport corridor. A pre-investment study for EWEC (ADB, 2001) has developed a framework for cooperation and development in agro-industry, infrastructure, trade and investment, tourism, and industrial estates, and recommended about 74 projects, including policy and institutional development initiatives.

5.4.1 Completed/Ongoing Infrastructure Projects along EWEC

Data from ADB's *GMS Development Matrix* has been used to appreciate the financing trends for completed and ongoing infrastructure projects along the EWEC. About 11 projects, comprising 9 transport and 2 investment projects are either completed or are under implementation along the EWEC. Transport projects comprise the improvement of road links and construction of missing links along the EW transport corridor, and rehabilitation of port facilities at Da Nang, Viet Nam. The investment projects comprise the Lane Xang Mineral project in Lao PDR and the feasibility study for Special Economic Zone (SEZ) in Savan-Seno along the Lao PDR-Thailand border.

5.4.2 Transport

The transport segment of the EWEC has been implemented with assistance from ADB, Japan Bank for International Cooperation (JBIC), Japan International Cooperation Agency (JICA), and other donor agencies and national governments. The transport corridor (1,450 km) starts near the Andaman Sea west of Myanmar and traverses through Thailand and Lao PDR before terminating near the South China Sea east of Viet Nam. The corridor links Mawlamyine–Myawaddy in Myanmar; Mae Sot–Phitsanulok–Mukdahan in Thailand; Savannakhet–Dansavanh in Lao PDR; and Lao Bao–Hue–Dong Ha–Da Nang in Viet Nam. While most of the highway is now operational, work on few sections in Myanmar is yet to be taken up. The highway provides crucial access to ports in northeast Thailand and central Lao PDR, and has opened opportunities to several medium-sized cities.

In the port sector, rehabilitation of the Da Nang port (in Viet Nam), intended to meet the region's increased tourism and trade needs prior to the completion of the EWEC transport project, was completed through JBIC (now JICA) loan assistance. A 15 km access road from the port to Highway 1 was also constructed.

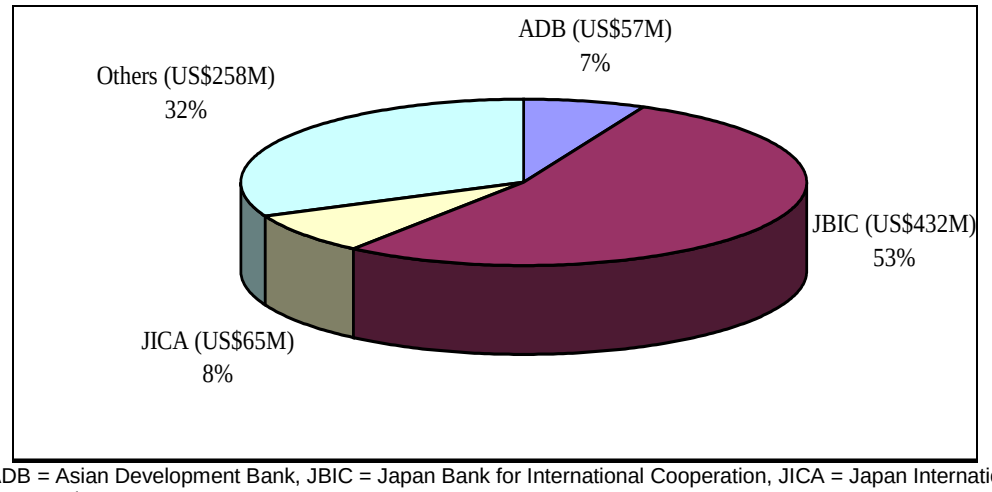
Table 9: List of Ongoing and Completed Projects along the East-West Economic Corridor

Project Name	Financing (US$ million)	Funding Agencies	Project Outline
Mawlamyine–Myawaddy Highway, Myanmar	100	Government of Thailand's soft loan to Myanmar	Improvement of Myawaddy to Mawlamyine roads in Myanmar comprising (i) Myawaddy–Kawkareik–Paan–Mawlamyine; and (ii) Myawaddy–Kawkareik–Mudon–Mawlamyine roads. Upgrading of first 18 km section of Mae Sot–Myawaddy–Mawlamyine road completed with assistance from Thailand.
Widening of Mae Sot–Mukdahan Highways, Thailand	75	JBIC Loan–¥5,620 million Govt. of Thailand – ¥1,870 million	Out of the total 770 km, 4-laning of 233km has been completed; 75km is under construction and 262km to be widened over 2007–11
Construction of missing links along Mukdahan–Sa Kaeo–Laem Chabang highways, Thailand	*	Government of Thailand (funding from WB & ADB is under consideration)	Construction of four road sections of Eastern Seaboard corridor
Second Mekong International Bridge, Thailand and Lao PDR[18]	100	JBIC Loan Thailand–¥4,079 million Lao PDR–¥4,011 million Rest by individual governments	Construction of Mukdahan–Savannakhet Bridge (1.6km) and approach roads (6km)
Access roads to Second Mekong International Bridge, Thailand	22	Government of Thailand	4–laning of RN 212 on Mukdahan side and widening of Mukdahan Bypass
Improvement of Xeno–Muang Phin highway, Lao PDR	65	Government of Japan (Grant through JICA)	Project involves 130–km road section [Seno–Phalan (70 km) & Phalan–Muang Phin (60 km)]
Improvement of Muang Phin–Dansavannh highway, Lao PDR	40	ADB Loan–US$32 million, and Govt. of Lao PDR–US$8 million	Rehabilitation of RN 9 (78 kms), including border crossing infrastructure, construction & improvement of rural roads, small bridges, river crossing systems, and other infrastructure.
Upgrading & Improvement of Dong Ha–Lao Bao Highway, Viet Nam	36	ADB Loan–US$25 million and Government of Viet Nam–US$11 million	Upgrading & improvement of RN 9 between Lao Bao and Dong Ha on Highway 1 (83 km), including upgrading of the Dong Ha bypass and border–crossing infrastructure
Construction of Dong Ha–Da Nang – Hai Van Tunnel, Viet Nam	251	JBIC loan–¥18.9 billion, and rest by Government of Viet Nam	Construction of two parallel 6.4 km tunnels, 5.9 km access roads and bridges along Highway 1, connecting Da Nang and Hue
Rehabilitation of Da Nang Port at Tien Sa, Viet Nam	124	JBIC Loan–¥10,690 million and rest by Government of Viet Nam	Upgrading 2 terminals, construction of a breakwater, 15 km access road to Highway 1.

ADB = Asian Development Bank, JBIC = Japan Bank for International Cooperation, JICA = Japan International Cooperation Agency, WB = World Bank. RN = Route Number
Note:*Data not available
Source: ADB website, GMS Development Matrix, 2006. available at http://www.adb.org/GMS/devt-matrix.asp

[18] This was the first ODA loan by JBIC for a crossborder infrastructure development project embracing two countries

Figure 8: Funding Sources for Transport Projects along East-West Economic Corridor



ADB = Asian Development Bank, JBIC = Japan Bank for International Cooperation, JICA = Japan International Cooperation Agency.

Source: ADB GMS site, available at: http://www.adb.org/GMS/Economic-Corridors.

Transport projects along the EWEC have attracted investments of US$813 million, primarily from donor agencies and from public resources of member countries. As noted in Figure 8, the JBIC has contributed about 53%, JICA 8%, ADB 7%, and others comprising financing from country governments, and other donor agencies, about 32%. Thus, transport projects along EWEC have not attracted finances from the private sector. On a few sections, a toll is being imposed, and the revenue generated is used to maintain the facility and service the debt.

5.4.3 Trade Facilitation and Crossborder Transport Agreement

The transport crossborder barriers along the EWEC have gradually decreased since 2000. For example, travel time between Khanthabouly (Savannakhet) bordering Thailand to Dansavanh bordering Viet Nam has been reduced from 12 hours to as low as 3 hours. Further, accessibility to education and medical services has also improved. In 2003, all member countries had signed the crossborder transport agreement (CBTA), and, with completion of the second Mekong bridge in 2006, developed through JBIC assistance, a major portion of the EWEC was ready for movement of goods and people.

Under the crossborder trade and investment flagship, a number of technical assistance (TA) programs were extended to the GMS countries. The assistance comprised formulation of the CBTA and support to member countries for framing annexes and protocols, institutional development and capacity building, laws and regulations improvement, and identification of means to mitigate non-physical barriers for crossborder movement. So far, an investment of US$5.5 million has been made, with ADB contributing about 74%, country governments nearly 22%, and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) about 3%. The procedures are being pilot tested along the Thai–Lao PDR border at Mukdahan–Savannakhet and at the Lao PDR–Viet Nam border at Dansavanh–Lao Bao and is being prepared for full implementation starting 2009.

5.4.4 Industrial Investment

A number of SEZ/industrial zone projects have been developed along the EWEC. Completion of the east-west corridor has shown positive impact in Savannakhet, including rapid increase in foreign direct investment (FDI). It is reported that total FDI increased from US$17.9 million during 1995–2000 to US$207 million during 2001–2005. This has resulted in the creation of jobs, which has improved socioeconomic conditions, and reduced poverty among people living in the border areas.

The Lao Bao SEZ, spread over 15,800 hectares of land, was the first SEZ developed in Viet Nam in 1998. An investment of US$25 million was made in providing basic infrastructure like electricity, water, and telecommunications. To attract private investors, preferential treatment was provided, including exemption from value-added tax, export/import tax, and special consumption tax. Corporate tax was waived for the first four years and discounted thereafter. Half of the personal income tax of laborers was waived and land lease was exempted for the first 11 years. As a result, about 45 projects with investment of nearly US$120 million were made by the year 2006. In addition, a major private sector project (Lane Xang Minerals Ltd.), costing US$205 million, has been developed by the Australian gold and copper producer, Oxiana, in this area.

The Savan-Seno SEZ (Lao's first SEZ) is under implementation and is scheduled for completion in 2011. The SEZ was identified by a JICA study, while the cost (US$300,000) for preparing the Feasibility Study was provided by the Government of Thailand. The SEZ comprises twin sites, one located near the Second Mekong International Bridge (305 hectares) and the other in Seno at east of Savannakhet (20 hectares). The industrial estates will function as export processing zone, free-trade zone, and free service and logistics center. To attract investments, preferential treatment is provided, including exemption from corporate tax for the first 5–10 years, exemption from import and consumption tax, as well as personal income tax discount of 5%. Land lease is allowed for 75 years, comprising free lease for the first 12 years if total lease period is more than 30 years.

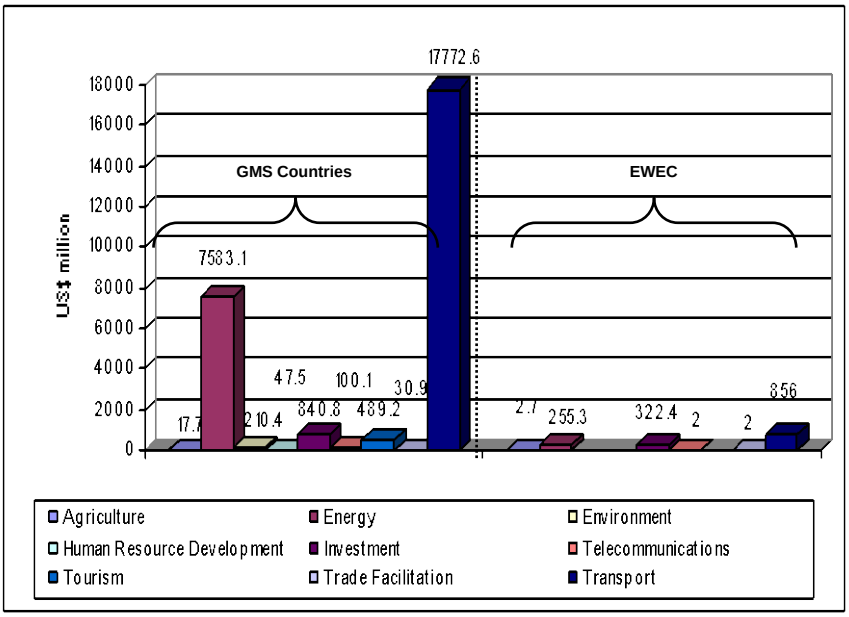
Further, with an objective to enhance PPPs and competitiveness, a 10-year fund with target capitalization of US$20–25 million has been created. The fund identifies sectors and industries for investment in Cambodia, Lao PDR and Viet Nam. ADB has extended 25% of the equity capital, while the balance has been contributed by other development financing institutions and private investors. The fund provides long-term equity support to small and medium-sized enterprises (SMEs) and invests in enterprises with strong growth potential, export orientation, and capable management. It targets enterprises that are able to generate employment, promote an environment that fosters economic growth, and forge regional cooperation in the GMS.

5.4.5 Financing for future Projects along East-West Economic Corridor

The ADB Development Matrix has identified about 356 projects throughout the GMS at an estimated cost of US$27.1 billion, out of which transport and energy sectors would comprise 66% and 28% respectively.

Forty projects, at an estimated cost of US$1.44 billion, are proposed along the EWEC. Considering that most of the east-west transport link is now functional, future initiatives shall be focused towards economic and industrial infrastructure. Accordingly, transport, investment, and energy projects are expected to constitute 59%, 22%, and 18% of the estimated cost respectively. It should be mentioned that the costs for some major initiatives, such as development of the western end of the EWEC and economic activities to be established by the private sector, are not included.

Figure 9: Estimated Cost for Proposed Projects in Greater Mekong Subregion



Source: Calculated by authors based on GMS database, available at http://www.adb.org/GMS.

The ADB report on GMS Flagship Initiative EWEC (ADB 2005d) indicates that major sources for funding these projects shall comprise government, multilateral development, and international lending agencies, foreign and local direct private investment, international private equity funds, and international and domestic capital markets. As mentioned above, the participating governments will have to shoulder a significant share of project costs, along with policy/program formulation, and implementation, and institutional development. In several cases, implementation of projects will require multi-country support, and cost-sharing will have to be evolved on a case-by-case basis.

5.4.6 Government Support

The EWEC traverses four countries and the road projects can be categorized as CBIP. However, all road improvement projects along the EWEC are funded by national governments and/or external donor partners, and private sector participation has been negligible. Such transnational roads do not cater for large traffic volumes and are not financially viable. These projects are considered as basic infrastructure projects and do not attract the private sector investment. However, once the basic road network is made available, other economic activities start gaining momentum and the private sector may later participate in ventures that are financially remunerative. Accordingly, leadership from national governments in planning and funding such crossborder transport projects and from the external funding agencies that support future development is highly important.

5.4.7 Project Benefits

To sum up, the GMS economic corridors would link the subregion with a direct outlet for trade with the rest of the world. There is no denying that the combination of improved access to trade and reduced impediments to crossborder trade would accelerate the economic development of the region, primarily along the corridors. These GMS corridors would encourage trade, investment, and tourism in the Mekong region, and ease the crossborder movement of people and goods, thereby increasing subregional economic growth and reducing poverty.

5.5 Hydropower Projects in Bhutan

Hydropower stations in Bhutan can be seen as success stories of crossborder energy projects between two friendly neighboring countries. Bhutan has 26 hydropower stations, out of which 4 major hydro plants (Table 10) are crossborder projects. Since the country's electricity generation is significantly higher than the maximum domestic demand of 130 MW, Bhutan is a net exporter.

5.5.1 Bhutan–India Hydropower Cooperation

The hydropower cooperation between the two neighboring countries started with the signing of the Jaldhaka agreement in 1961. The Jaldhaka hydel is located on the India side of Indo-Bhutan border in West Bengal. The 27 MW Jaldhaka Hydel Power Station Stage-I was commissioned in 1967–1972 and the Stage-II Power House, with an installed capacity of 8 MW was commissioned in 1983. Most of the power produced at Jaldhaka is exported to Southern parts of Bhutan. The benefits of the crossborder energy trade have encouraged Bhutan, which has a hydro potential of over 30,000 MW, to seek Indian investments in setting up power plants.

Table 10: Crossborder Hydropower Projects in Bhutan

Location	Financial closure	Investment (US$ million)	Investment Type	Investor
Chukha (336 MW)	1988	200	Government grant and loan	Indian Government
Kurichhu (60 MW)	2002	119		
Tala (1020 MW)	2003	812		
Basochhu (64 MW)	1997	220		Austrian Government

Source: Ministry of Power, Government of India.

The India–Bhutan partnership in hydropower effectively started in 1978, when India extended US$200 million for construction of a 336 MW hydroelectric plant at Chukha in Bhutan. The Chukha hydel project was entirely funded by the Government of India with a 60:40 ratio of grant and loan. It was successfully commissioned in 1988, and the project was handed over to the Bhutanese government in 1991. About 70% of power generated from this project is exported to India. India is also helping Bhutan in providing training and human resource development in the power sector.

Apart from Chukha, India has also implemented the Kurichhu and Tala hydropower projects in Bhutan. Looking at the financial benefits of crossborder energy projects, the Royal Government of Bhutan has requested India to develop a 1095 MW hydro plant at Punatsangchhu.[19]

5.5.2 Tala Hydropower and Transmission Project

The Tala Hydroelectric project is the biggest crossborder power project in South Asia. This 1,020 MW project has been constructed with an investment of around US$1 billion, that is entirely funded by the Government of India (GOI) by way of grants and loans at a 60:40 ratio. Once the project is fully completed, all power from this project will be exported to India. The first phase (170 MW) of this project was commissioned in May 2008.[20] This project has attracted several public and private sector investors in construction (mostly Indian contractors) such as Bharat Heavy Electrical, Hindustan Construction Company, Larsen and Toubro and Jaiprakash Industries.

[19] The Indian Prime Minister laid the foundation stone of this plant during his visit to Bhutan in May 2008.

[20] This plant was officially inaugurated by the King of Bhutan and the Indian Prime Minister, during the visit of the Indian Prime Minister to Bhutan in May 2008.

The project has also attracted private sector investment downstream of the development. For example, a joint venture company has been formed for transporting power from the station to the northern states in India.[21] The joint venture company (Powerlinks Transmission Limited (PTL)) established under the PPP format is jointly owned by Tata Power and the Power Grid Corporation of India, a government-owned company. In 2003, ADB extended a US$62 million loan for this power transmission project, which is a classic case of multi-lateral funding support for private sector power projects in India. The transmission lines were developed under a BOOT basis with a concession period of 30 years; thereafter the ownership will be transferred to the government-owned Power Grid Corporation of India.

5.5.3 Proposed PPP in Hydropower

The Bhutan Government has planned the Dagachhu hydropower project (114 MW), which aims to export power to India. This project is proposed as a demonstration project to be financed by leveraging public and private capital in line with a new policy for private participation in hydropower in Bhutan. The hydropower site will be a run-of-the-river type with barrages where water will be diverted to the powerhouse, and no major backwater will be created (ADB 2007). The project is planned to be implemented under the clean development mechanism as defined in the Kyoto Protocol. The Government of Austria has supported the feasibility study and preparation of the project design document.

5.5.4 Challenges and Needs

Theoretical potential for hydropower in Bhutan is 30,000 MW, with only about 5% tapped so far. The hydropower sites are mainly export-oriented and run-of-the-river types. To accelerate them on a sustainable basis, Bhutan has to establish a policy and institutional framework for private participation such as PPP and independent power producers (IPPs).

The Bhutan–India example is a classic case of cooperation between two friendly neighboring countries under which a power-deficient country is allowed to set up hydropower stations under a majority grant and low-interest loan contribution. All power from the station is sold to India on a commercial basis, which means the project has negligible risk exposure.

In order to strengthen hydropower generation, rural electrification, region-wide energy efficiency, and crossborder economic cooperation through PPPs, ADB has sanctioned a US$1.91 million technical assistance (TA) to Bhutan. The TA is being financed on a grant basis by the Japan Special Fund, funded by the Government of Japan. The Government of Bhutan is expected to finance US$310,000, equivalent of local currency costs through in-kind contributions.

5.6 Malaysia-Singapore Second Link

This is the second border crossing bridge (also known as ‘Second Crossing’ or ‘Linkedua’) between Malaysia and Singapore, and connects Tanjung Kupang/Johor in Malaysia with Tuas in Singapore. The bridge was built with an objective to reduce traffic congestion at the Johor–Singapore Causeway (the first border crossing between the two countries constructed in 1920). On the Malaysian side, the bridge connects the Second Link Expressway (Linkedua Expressway), while, on the Singapore side, it connects with the Ayer Rajah Expressway and the other supporting roads around the Tuas industrial area.

The 1.92 km twin deck bridge accommodates dual three-lane carriageways. Besides the bridge, the project comprises 44 km of expressways, a customs, immigration, and quarantine complex, 3 toll plazas, 2 rest and service areas, and other ancillary facilities. In

[21] Specifically, this transmission project involved construction of the transmission lines (1,166 kms.) from Siliguri in West Bengal via Bihar to Mandola in Uttar Pradesh. For further details, visit, http://www.powerlinkstransmission.com

addition, development of a new town in Johor State, Malaysia is also included. The bridge, designed to cater to about 200,000 vehicles a day, was opened to traffic in January 1998.

5.6.1 Project Facilities

The crossborder link provides safe and congestion-free travel, with quick customs and immigration clearances. The checkpoint on the Singapore side, the Tuas Checkpoint, has 24 immigration lanes for light vehicles (cars) and 10 lanes for motorcycles. The corridor is equipped with traffic monitoring and surveillance systems that provide travel advisories through variable message signboards. The rest and service areas provide for restaurants, Muslim prayer room, toilets, showers, playground, petrol stations, and public phones. The toll plaza provides for manual and semi-automatic system (using smartcards). Cash at the toll plaza is accepted in both currencies, however, on a one-for-one basis.

5.6.2 Implementation Arrangement and Investors

A concession agreement (CA) was signed in July 1993 with United Engineers Malaysia Berhad (UEM) for implementing the project on a BOT basis. The CA gave exclusive rights and authority to UEM to design, construct, manage, operate, and maintain the bridge and expressways for a period of 30 years. In May 1994, through an agreement, UEM assigned all its rights, liabilities, and obligations in respect of the CA to Linkedua Malaysia Berhad–LINK, a wholly owned subsidiary of UEM.

Being a crossborder facility, an intergovernment agreement (IGA) was signed in March 1994 for defining the responsibilities of both governments with regard to the design, construction, operation, and maintenance of the bridge. Further, in September 1994, a Supplemental Concession Agreement (SCA) was signed to take into account the IGA between the Governments of Malaysia and Singapore. As per the SCA, LINK's obligation to carry out the project and its rights under the CA are consistent with the Malaysian government's obligation under the IGA relating to the works and the rights in connection with the Malaysian side of the bridge and the customs complex. A joint committee comprising representatives of each government was formed to oversee the project implementation. The award was valued at RM1.6 billion plus a S$600 million component from Singaporean investors.

Project sponsors on the Malaysian side include the Malaysian Highway Authority (LLM), Government of Malaysia; PLUS Expressway Berhad; and Linkedua Malaysia Berhad; the Land Transport Authority, Government of Singapore, was the sponsor on the Singapore side. The project on the Malaysian side of the bridge is maintained by Malaysia PLUS Expressway Berhad and Linkedua Malaysia Berhad, while the Land Transport Authority (LTA) of Singapore is responsible for maintaining the project on the Singapore side.

5.6.3 Project Risks and Mitigation Measures

Projects of such magnitude require large cash flows during the initial years of operation, followed by sustained revenue through user charges to meet the project's expenses and service the debt component. In order to make the project attractive, the financial viability was enhanced by providing rights to the concessionaire for developing a new township in southwest Johor Darul Ta'zim called Prolink 2020. The township was jointly developed by the project company based on a cost-sharing arrangement with Prolink Development (PD), also owned by UEM. After completion of the bridge, all rights, liabilities, and obligations under these agreements were to be transferred by the project sponsor to PD against a pre-determined cash payment.

For road projects of such nature, future growth in traffic is a major risk and can considerably affect the project revenues. After it opened in 1998, traffic on the bridge was only about one-third of the original estimate. As a result, the project company has been continuously facing problems in its debt-service payment. Information in the public domain reveals that cumulative revenue of the concessionaires in the year 2007 was RM27.6 billion, while the

total cumulative net profit was RM3.5 billion. In order to ensure financial returns to the project developers, the government is planning to pay compensation to toll concessionaires in the form of prolonged concessions.

Recently, after realizing that higher toll rates are a deterrent to road use, the Malaysian government is considering revisiting the concession agreements with the possibility of reducing toll rates by balancing toll reduction with O&M cost and payback to financiers. Considering the risks associated with private sector transport projects, the recent interventions by the Government of Malaysia can be seen as positive steps in building the confidence of the private sector.

5.7 Indonesia–Singapore Gas Pipelines

The Indonesia–Singapore gas pipelines are successful cases of crossborder energy projects. Both countries have intensified interaction and cooperation in the energy sector and have played a leading role in setting up the "Trans-ASEAN Gas Pipeline" (TAGP) that envisions the establishment of a transnational pipeline network linking the major natural gas producers and consumers in Southeast Asia.[22]

In January 1999, the Singaporean consortium SembGas signed an agreement to purchase West Natuna natural gas from the Indonesian state energy company Pertamina. Indonesia began exporting natural gas in 2001, with the opening of a 400-mile, 325-million cubic feet per day (ft^3/day) sub-sea pipeline from West Natuna to Singapore. In August 2003, a second natural gas connection to Singapore was opened when the South Sumatra–Singapore pipeline was completed. This line reached 350 million ft^3/day maximum capacity during 2006 and will deliver natural gas to Singapore over a 20-year contract. Another 100 million ft^3/day of natural gas is expected to be delivered via the Asamera pipeline from the Conoco Phillips field to power Singapore's planned Island Power station; however, the project has experienced numerous delays.

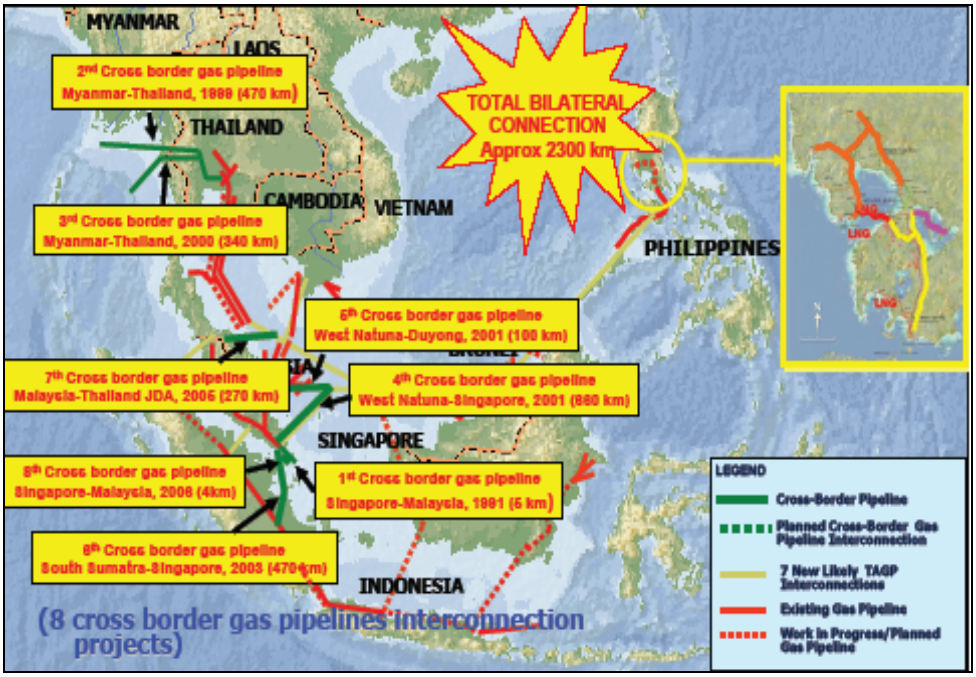
The gas transmission pipeline is operated by Indonesia's PT Perusuhaan Gas Negara (PGN). The pipeline cost of US$420 million, was raised in the form of US$112 million in loans from the European Investment Bank, US$88 million from ADB and the remainder from PGN.

5.7.1 Emerging Issues

Natural gas use is rising rapidly, as the Singapore government promotes policies aimed at reducing carbon dioxide and sulfur emissions, ensuring energy security, and promoting the country as a regional hub for an integrated gas pipeline network. In 2002, the Singapore government set a target of 60% of the country's electricity to be generated from natural gas by 2012. By 2003, this goal was already achieved, and Singapore's Energy Market Authority (EMA) reports that about 80% of the country's electricity demand comes from natural gas today. However, in November 2003 and June 2004, Singapore experienced power outages that were the result of natural gas supply disruptions. After the June 2004 incident, the government set up the Energy System Review Committee (ESRC) to study the root causes of the gas disruptions and evolve measures to strengthen the energy system's reliability. Among other recommendations, the ESRC called upon Singapore to diversify its sources of natural gas, as it has historically relied on Indonesia for its natural gas imports.

[22] The TAGP concept was initially proposed in 1997 as part of ASEAN's "Vision 2020" initiative. In July 2002, energy ministers from the ASEAN countries signed a memorandum of understanding to study the viability of the project, although much work remains to be completed to fully realize the project's goals (for more information, see ASEAN's Plan of Action for Energy Cooperation, 2004–2009).

Figure 10: Existing Crossborder Gas Pipelines in Association of Southeast Asian Nations*



Note: *As on March 2008. Boundaries are not necessarily authoritative.

Source: Chantanakome (2008) and ASEAN Centre for Energy, Jakarta.

5.8 Myanmar–Thailand Gas Pipelines

The bulk of gross national hydrocarbon production in Myanmar is accounted for by the prolific Yadana and Yetagun offshore fields, which have a combined average output of over 800 million ft^3/day of gas. About 80% of this yield is piped to Thailand, with the balance going to domestic needs, all of which is used for electrical power generation. Myanmar and Thailand have two crossborder gas pipelines (Figure 10), developed through PPP: the Yadana (Myanmar)–Ratchaburi (Thailand) pipeline, completed in 1999, and the Yetagun (Myanmar)–Ratchaburi (Thailand) pipeline, completed in September 2000.

5.8.1 Yadana gas pipeline

The Yadana gas field is located about 60 km offshore to the nearest landfall in Myanmar. This major energy resource contains more than 5.3 trillion ft^3 (150 billion m^3) of natural gas, with an expected field life of 30 years. Output from the field averaged over 19.3 million m^3/day per day in 2006, where Thailand imports about 700 million ft^3/day. The Yadana pipeline is 256 miles (412 km) long, most of which is underwater. Construction of the pipeline was completed in 1998 and had a cost of US$1.2 billion, US$394 million of which went to laying the pipeline.

The Yadana project is operated by Total S.A., France, with Unocal Corporation, USA, as its junior partner along with PTT, a Thailand-owned oil and gas company, and Myanma Oil and Gas Enterprise (MOGE), a state-owned enterprise of Myanmar. The field was developed under a conventional production-sharing contract by four investors:

- Total, S.A. (operator): 31.24%
- Chevron Corp: 28.26%[23]
- Petroleum Authority of Thailand Exploration & Production (PTT-EP): 25.5%; and
- Myanma Oil and Gas Enterprise (MOGE): 15%

A memorandum of understanding was signed by Total and MOGE on 9 July 1992 for operation of this gas field and the pipeline. In addition to the construction of offshore gas facilities by the partners, a separate company in which PTT-EP, MOGE, and other subsidiaries of Total and Unocal are investors (the Moattama Gas Transportation Company (MGTC)) built a 346-kilometer sub-sea pipeline to bring the gas to landfall in Myanmar, and a 63-kilometer onshore pipeline, with control and metering units, to carry the gas to the border with Thailand, which purchases most of the field's output under a long-term contract. Construction was carried out between the fall of 1995 and mid-1998, with gas production beginning in July 1998. Since its inception, this gas pipeline is working successfully.

Yetagun gas pipeline

The Yetagun natural gas field is located in the sea at the depth of 337 feet and about 125 miles away from Myanmar coast. It is estimated that the Yetagun natural oil and gas field has 1.1 trillion cubic feet of natural gas (PTT, 2007). Thailand imported about 1.16 billion cubic feet per day from the Yetagun gas field during 2007.[24]

This second gas field was developed through PPP at a cost of about US$830 million, of which US$325 million was for laying the pipeline, both onshore and offshore, between Yetagun, Myanmar and Ratchaburi, Thailand. Malaysia's Petronas[25] is the operator of the Yetagun gas field, along with Nippon Oil, PTT, Thailand, and Myanmar-owned MEPE, and the project has the following shareholdings:

- Petronas (operator): 40.9%
- Nippon Oil, Japan: 24.8%
- PTT, Thailand: 19.3%
- MOGE, Myanmar: 15%

The project is developed under a long-term contract and a 30-year power sales agreement (PA) was signed in March 1997 stipulating a daily contract quantity (DCQ) of 260 million ft^3/day of natural gas to be delivered to PTT, Thailand. Construction was carried out from 1997 to 2000, and transmission started in 2001.

The two crossborder gas pipelines developed under PPP have been providing enormous wealth to Myanmar. Gas has thus become a major export earner for Myanmar, accounting for over 30% of its yearly export earnings (Thein and Myint 2008). Even then a large population of Myanmar does not have access to electricity. Setting up a domestic power plant from the crossborder gas export earnings would help Myanmar to strengthen rural electrification and industrialization. At the same time, Myanmar should open prospective hydropower projects to local and regional private sectors in order to achieve targeted objectives in the short term. In parallel, creation of a better investment climate and energy regulatory environment would be essential for proper energy sector development in Myanmar and regional cooperation.

[23] A subsidiary of Unocal, further to its acquisition of Unocal in 2005.

[24] The Yetagun gas field was suspended supplying gas to Thailand on 2 April 2008 due to gas pipeline leakages.

[25] Petronas became involved in Yetagun through the acquisition of Texaco's 30% project interest in 1997.

6. INVESTMENTS IN CROSSBORDER INFRASTRUCTURE: LESSONS FROM LATIN AMERICA

With the launch of Mercosur and Andean Community, South American countries have realized that intra-regional trade will not significantly mature until and unless they strengthen the region's physical infrastructure, particularly the crossborder infrastructure. In October 2000, 12 South American countries launched an unprecedented multinational, multisectoral, and multidisciplinary initiative whose main objective is to develop the region's infrastructure.[26] Supported by the Inter-American Development Bank (IDB), the Corporation Addina de Fomento (CAF), and the Financial Fund for the Development of the River Plata Basin (FONPLATA), the Initiative for the Integration of Regional Infrastructure in South America (IIRSA) pursues regional integration based on a hub strategy. It seeks to promote the development of transport, energy, and telecommunications infrastructure from a regional viewpoint, with the goal of the physical integration of the twelve South American countries and the achievement of an equitable and sustainable territorial development pattern. IIRSA has carried out joint work with the participating countries and multilateral institutions, focusing its efforts on three main areas: Building of a Strategic Vision for the Physical Integration of South America, Integration and Development Hubs, and Sectoral Integration Processes.

6.1.1 Integration and Development Hubs

Integration and Development Hubs, as outlined in IIRSA, are multinational territories involving natural spaces, human settlements, production areas, and current trade flow. South American countries have identified 10 initial hubs, namely, (i) Andean hub, (ii) South Andean hub, (iii) Capricon hub, (iv) Paraguay–Paraná Waterway Hub, (v) Amazon hub, (vi) Guianese Shield Hub, (vii) Southern hub, (viii) Central Interoceanic Hub, (ix) Mercosur–Chile Hub, and (x) Peru–Brazil–Bolivia Hub, for development of infrastructure and regional integration.

Table 11: Initiative for the Integration of Regional Infrastructure in South America Project Portfolios, 2007

	No. of Projects	Estimated Investment	Share
		(US$ million)	(%)
Mercosur–Chile Hub	91	19,464.80	28.51
Peru–Brazil–Bolivia Hub	23	17,561.10	25.72
Andean Hub	65	6,096.70	8.93
Capricon Hub	63	6,083.00	8.91
Guianese Shield Hub	32	5,847.20	8.56
Central Interoceanic Hub	49	4,651.30	6.81
Amazon hub	57	3,208.40	4.70
Paraguay–Paraná Waterway Hub	98	2,828.80	4.14
Southern Hub	26	2,529.80	3.71
Others (PSI)	2	2.90	0.00
Total	506	68,274.00	100.00

Note: *Share in estimated investment
Source: IIRSA (2007).

[26] This initiative was adopted at a meeting of South American presidents held in Brasilia, Brazil, in August 2000 at which the region's leaders agreed to take joint actions to promote South American political, social, and economic integration that includes the streamlining of regional infrastructure and specific measures to foster the integration and development of isolated subregions.

The rationale for IIRSA therefore goes beyond the need for infrastructure development. According to Moreira (2008), IIRSA is part of a broader case for South-South integration as a tool to promote higher productivity, equity, and growth. Infrastructure investments in IIRSA will create new opportunities for sustainable development for the population of these territories. This crossborder development and planning of South American territory aims to facilitate access to areas with a high potential productivity, which are currently either isolated or underutilized due to the deficient provision of basic transport, energy, or telecommunications services.

Table 12: Implementation Progress and Sources of Financing, 2003–2006

	Investment Proposed	Sources of Financing (US$ million)				
		Government	Private	IDB*	CAF*	FONPL*
Andean hub	2,617.40	1,599.20	944.70	23.00	50.50	0.00
Capricon hub	1,643.60	812.40	12.00	540.00	144.20	135.00
Amazon hub	1,884.30	1,313.60	410.70	160.00	0.00	0.00
Guianese Shield Hub	657.40	390.90	0.00	120.50	96.00	0.00
Southern hub	1,123.30	1,104.30	0.00	0.00	0.00	0.00
Central Interoceanic Hub	3,077.20	2,379.80	114.30	77.00	506.10	0.00
Mercosur–Chile Hub	8,647.40	5,398.00	2,371.00	539.00	199.30	10.00
Peru– Brazil– Bolivia Hub	1,541.10	203.30	554.60	208.70	546.50	28.00
Others (PSI)	2.90	1.00	0.00	1.90	0.00	0.00
Total	21,194.60	13,202.50	4,407.30	1,670.10	1,542.60	173.00
Share in Total Investment (%)		62.29	20.79	7.88	7.28	0.82

PSI = private sector investment

Note: Multilateral funding

Source: IIRSA (2007).

6.1.2 Project Portfolios

The 12 countries involved in IIRSA have agreed to 506 priority infrastructure projects with an investment of US$68.27 billion, of which US$6.4 billion, comprising 31 projects, will be invested in 2010 (Table 11). The planning process was conducted from 2003 to 2006, and based on consensus, the Mercosur–Chile Hub and the Peru–Brazil–Bolivia Hub together will share half of the total estimated investment. Investments in remaining hubs have been less than 10% of estimated total investment in IIRSA. Except for the Southern Andean hub, where the technical works have not yet been developed yet in the framework of IIRSA, the rest of the IIRSA hubs are covered in the first phase of this project. According to the IIRSA (2007), investment in crossborder transportation appears to be 55% (about US$38 billion), and the rest is shared by energy pipelines and telecommunications infrastructure.

6.1.3 Sources of Financing and Implementation

Implementation of 31 projects, falling under eight IIRSA hubs in South America, is also moving fast. As shown in Table 12, about US$21.19 billion has already been sourced during 2003–2006 for financing these projects, including 14 that are being executed via PPP (IDB, 2006).

Table 12 also indicates that the majority of the infrastructure investments have come from governments of South America. They have agreed to invest about US$13.20 billion (62.29%), followed by the private sector (US$4.41 billion), sharing 20.79% of total investment. The rest has been sourced from multilateral funding institutions like IDB (US$1.67 billion), CAF (US$1.54 billion), and FONPLATA (US$0.17 billion). Proposed

private sector investment in South America is almost four times higher than that of Asia, where private sector investment in crossborder infrastructure via PPPs was about US$5 billion during the last decade and a half.

6.1.4 Public Private Partnerships in IIRSA

IIRSA implies a long-term effort and therefore the countries have attached a high priority to the search for financial mechanisms and instruments suited for the purpose of developing IIRSA projects. In general, IIRSA has pursued three lines of action: the adoption of PPPs, the use of public investment in the budget (which is termed as fiscal margins or room), and design of financial instruments tailored to IIRSA's need.

The PPP has proved useful to all the participants of IIRSA (Carciofi 2008). Countries in IIRSA have been adopting a wide variety of approaches to private sector involvement. For example, Chile and Peru have had some experiences in PPPs, Brazil has passed novel legislation on PPP to support projects that could not otherwise be financed by its budget, and Argentina, which took a lead in PPPs in 1990s, has been experimenting with newer forms to encourage private sector participation in infrastructure projects. As the countries adopt PPP models for the development of their infrastructure, both public and private sectors gain better insights into this type of contract scheme. This broadened knowledge has in turn helped South American countries to pursue crossborder integration projects under IIRSA, which are more complex because of their crossborder implications.

6.1.5 Lessons for Asia

The experiences of Europe and Latin America, where the presence of crossborder infrastructure is comparatively high, and to a lesser extent, Africa, where the development of crossborder infrastructure has taken a new shape, suggest that regional cooperation has been promoting greater prosperity and stability for participating countries. A major success determinant is their ability to build regional initiatives that are based on a shared strategic vision, as shown in the Initiative for the Integration of Regional Infrastructure in South America (IIRSA) of Latin America (Carciofi 2008).[27]

The IIRSA has been guided by two principles—open regionalism and PPP, which offer useful lessons for crossborder infrastructure development in Asia. Asia is considered a fully integrated geo-economic territory, in which it is necessary to minimize internal barriers to trade and bottlenecks in infrastructure as well as in the regulation and operation systems that support productive regional activities. While trade liberalization facilitates the identification of highly competitive productive sectors at the global level, viewing Asia as a single economy also makes it possible to retain and distribute more benefits from trade in the region and to protect the regional economy from global market fluctuations.

As regards PPPs, the region's development challenges call for shared leadership and coordination between governments (at their different levels) and the private business sector, including the promotion of strategic PPPs for funding investment projects, and consultations and cooperation for developing an appropriate regulatory environment to ensure significant participation of the private sector in regional development and integration initiatives. This notion of shared leadership sets the basis for permanent dialogue between governments and businesspersons to support the planning and guiding function of the former, and facilitates project funding, execution, and operation responsibilities on behalf of the latter.

[27] The Initiative for the Integration of Regional Infrastructure in South America (IIRSA) is a dialogue forum among the South American countries, which seeks to promote the development of transport, energy and telecommunications infrastructure from a regional viewpoint, aimed at physical integration of the 12 South American countries and the achievement of an equitable and sustainable territorial development pattern. About US$68.27 billion, comprising 508 infrastructure projects, having direct or indirect crossborder implications, have been identified for investments across 12 Latin American countries, of which 12 projects are being executed under PPP. Source: IIRSA.

The idea of development as a shared responsibility of governments and the business sector promotes the design of innovative funding, execution, and operation formulae for the so-called "structuring" projects (those that make other projects feasible), sharing risks and benefits and coordinating each party's actions.

7. CONCLUSIONS AND POLICY RECOMMENDATIONS

This paper has examined a range of crossborder infrastructure development issues related to the Asian countries. While tariff barriers have come down in Asia, international infrastructure along with "behind the border" issues have become important for deepening regional cooperation and integration. This suggests that there is significant potential for economic gains through deeper regional cooperation in Asia.

Despite the active pursuit of private investment in infrastructure by most developing countries in Asia and a growing number of success stories, the pace of such investment remains slower than initially expected. Participation by the private sector in infrastructure development has been mixed. While there has been moderate progress in national infrastructure development by the private sector, progress is rather limited in the case of development of crossborder infrastructure in Asia. The paper indicates that Asian countries have attracted higher private sector investment for development of national infrastructure projects like seaports and airports, compared to crossborder infrastructure projects in the past. The rising trend in private investors in infrastructure projects indicates a decline of investments by developed country investors.

The paper has clearly brought out that private sector investment in crossborder energy sector projects exceeds that found globally in the transport, telecommunications, or water sectors. In the Asian context and when all modes of financing crossborder projects are considered, energy sector projects still dominate the investment scenario.

Crossborder energy (power generation or natural gas) projects are driven by demand–supply pressures within countries and the cost economics associated with acquiring equivalent energy from other sources. In this sector, the commodity output, power or natural gas, is easily tradable and can be sold to power-deficient countries under long-term agreements, thereby providing opportunities to the host country to earn foreign exchange revenue and, as well, to improve its economic condition. Risks associated with energy projects, like environment/social issues, political uncertainties, etc., are more or less limited to the pre-completion stage, and post-implementation risks are limited.

On the other hand, crossborder transport (road/highway) projects involve higher risks associated with traffic growth, willingness-to-pay, political equations, environmental and social issues, etc. Transport projects involve the physical cross-over of people and goods involving long, drawn-out formalities at border checkpoints. In a few cases, adverse political relations impact traffic, and, thereby, revenue. Crossborder transport projects are also tagged with social problems, like drug/human trafficking, HIV/AIDS risks, etc.

By considering all modes of financing, this paper has found that crossborder infrastructure financing in Asia has witnessed an upward trend in the last decade and a half. Given the huge infrastructure investment needs of the region and insufficient government resources, the role of the private sector and PPP in enhancing infrastructure facilities in Asia, particularly crossborder infrastructure, is crucial.

The review of the case studies of CBIPs clearly indicates that the major reasons for the slow progress of international infrastructure development by the private sector are many, and comprise both economic and non-economic issues. Many of the new investments (such as transportation and energy) in crossborder infrastructure seem to be viable on commercial terms but non-workable when non-economic factors are considered. Also, preconditions for private financing of infrastructure (e.g., revenue-sharing, energy tariff fixation, etc.) are more

difficult to establish than is commonly realized. In addition, inadequate preparation leading to unanticipated problems and delays in implementing infrastructure projects is also seen as major drawbacks for limited response of private sector. While some projects have been operating successfully, some were stalled or abandoned, mainly due to political reasons (e.g., the Bay of Bengal Initiative for Multisectoral Technical and Economic Cooperation Highway). Indeed, public sector investment drives crossborder energy and transportation projects in Asia, whereas private sector investments have picked up the pace only recently, specifically after the 1997 Asian financial crisis.

Trends in the GMS show that crossborder road transport projects have not yet attracted private investments upstream. Considering the complexities of the issues involved, and the fact that transport is a basic prerequisite for economic development, major parts of funding along with policy/program formulation and institutional reforms have of necessity been shouldered by national governments in the past, and the trend will have to continue in the future. The role of multilateral and bilateral development agencies is very important for facilitating dialogues between neighboring countries, evolving subregional plans, providing technical advice, and financing and mobilizing resources for project implementation. The EWEC, and the entire GMS program as a whole, have demonstrated this effect (Butphomvihane 2007).

Conventionally, the private sector is willing to participate in low-risk, high-return projects. However, crossborder projects are bundled with several risks: political, social, economic, etc. As a result, the private sector is hesitant to participate even in high-return projects. In such circumstances, the role of multilateral and bilateral development agencies in extending guarantees is very important. The Theun Hinboun and NT2 hydropower projects were able to attract private investment due to sustained support (comprising funding, covering political and risk guarantees, and crucial support in implementing environmental and social rehabilitation and mitigation measures) from donor agencies like ADB, World Bank, and MIGA.

Both environmental and social issues, including resettlement and rehabilitation of project-affected persons, need to be studied in sufficient detail and mitigation measures evolved during the project design stage itself in order to avoid problems during implementation and completion. An inclusive approach whereby the project-affected persons are equally and rightfully involved with evolving and implementing the mitigation plans works well as observed in the NT2 project.

Development of economic infrastructure comprising special industrial and economic zones requires considerable investments, mainly from the private sector. However, basic infrastructure, in the form of roads, water, electricity, and telecommunications services are expected from the public sector. The SEZs along the EWEC have attracted some private industries and investments once the east-west road corridor became operational, providing much-needed connectivity to the Da Nang port on the Viet Nam side.

Development of transport linkages has to be equally complemented with efficient operational procedures comprising crossborder transport agreements and elimination of non-physical impediments for the movement of goods and people. This includes simplified customs procedures, cooperation to reduce the need for inspection and quarantine measures, improve trade logistics, etc. ADB has played an important role in GMS through technical assistance to the neighboring countries in framing crossborder transport agreements and drafting the associated annexes and protocols. ADB has also been instrumental in capacity-building activities (institutional and human resources development) for enhancing the effectiveness of the program. Private sector participation in financing and operating CBIPs in the transport sector is expected to facilitate and act as a catalyst in improving operational procedures across international borders (e.g., GMS crossborder transport agreements).

Case study analysis also shows that the following prescriptions will better facilitate CBIPs which, despite their obvious advantages, still face a number of hurdles in Asia:

- Standards and labels are widely acknowledged as an effective means to improve CBIP efficiency. Crossborder connections, be they energy or transport, require harmonization of national legal and regulatory frameworks, as well as pricing schedules. Common technical standards for design and construction, operation and maintenance, safety, etc. are also necessary.
- The need for active participation of the private sector in CBIPs in demonstrated by the example of gas distribution, which is currently controlled by a monopoly held by state-owned petroleum companies in many ASEAN countries, limiting private sector participation and investment. Countries in Asia should open up the entire downstream sector of CBIPs. Asian countries should formulate a competition policy across Asia to enhance investment efficiency for CBIPs.
- Individual governments must also move toward a market-based pricing system and away from practices, such as price intervention and tax distortions, that lead to inefficient pricing of CBIPs (e.g., natural gas and gas-related products and services).
- The emergence of the PRC and India has significant implications for regional patterns of CBIP usability. A detailed understanding of the CBIP dynamics is thus particularly valuable.

7.1 Mechanisms to Strengthen CBIPs

- Greater spending on infrastructure to meet growth needs in Asia requires stronger partnership between government and private sector. Attracting both local and international private sector investment requires clear regulatory frameworks, especially on key elements such as tariff regulation, maintaining a level playing field with incumbent public sector players, clear concession agreements (for example, termination, change in law, force majeure, and competition policy) and competing facilities.
- Despite such risk mitigation such as local currency financing, long-term fixed interest rates, etc., active support and leadership from national governments in sharing project risks, extending tax benefits and facilitating matters related to land acquisition, environment, resettlement and rehabilitation, customs, etc. are essential as they provide much-needed confidence to the private sector in implementing CBIPs
- To foster new developers—both regional and south-south—the involvement and participation of multilateral donor agencies is important not only towards funding assistance but also in sharing project risks, providing technical assistance and guidance in environmental/social matters, etc. Donor agencies can play the role of an honest broker and help facilitate dialogues on important matters related to CBIPs.
- Independent panels and review committees with participation from donor agencies and the active involvement of project-affected persons in implementing social/environmental mitigation measures have been shown to be successful, as with the NT2 project.
- In order to gain support from the local population, a part of the revenue generated from the CBIPs should be reinvested for social and economic development activities around the project area.
- Transparent subsidies for essential services would attract regional and international investors in CBIPs.

- Two far-reaching approaches towards CBIPs would be leveraging a demand-side approach by creating bankable PPP projects, and leveraging a supply-side approach by mobilizing more appropriate products and local currency financing for infrastructure.
- National governments and donor agencies will have to continue supporting development of basic infrastructure in bordering areas. The case study of EWEC reveals that once basic infrastructure is developed, the private sector is attracted and participates in investment projects in the long run.
- Considering the risk associated with CBIPs and depending on revenue accruals, project developers may have to consider revisiting or renegotiating the concession document so as to ensure sufficient and safe returns to private entrepreneurs.
- Implementation of operational components (e.g., trade facilitation) is more complicated than the infrastructure project itself, and sufficient emphasis on technical support and capacity building from government agencies involved with border trade activities should be accorded in order to achieve the planned objectives.
- Innovative financing mechanisms to make the CBIPs more attractive for the private sector (like development rights for townships for the entrepreneur) need to be evolved.

7.2 Way Forward

Since Asia has a wide and vibrant base of local investors, and since limited public resources are not able to meet all of Asia's required investments for crossborder infrastructure, Asian countries are exploring avenues for increasing investments in national and crossborder infrastructure through a combination of PPP and exclusive private investments. It is argued in the literature that PPP is one of the best-suited options for the development of national and international infrastructure.[28] It supplements scarce public resources, creates a more competitive environment, and helps to improve efficiencies and reduce costs. In most cases, it also meets the specific financing requirements of stakeholders and beneficiaries.

Another perspective on infrastructure financing through PPP is that there are large financial market implications in the redirection of Asian savings from non-Asian money center financial markets to regional markets that can handle massive physical infrastructure investments (Summers 2006; Agarwala and De 2007; Krueger and Bhattacharya 2008). Therefore, this must be added to the very large ancillary investments that serve the new physical infrastructure: many of these will be private, but there will also be a significant public sector component as well as crossborder elements.

For many crossborder infrastructure investments, PPP is emerging as the preferred instrument, where the private sector gets its normal financial rates of return while the public sector partner provides concessional funding based on the long-term direct and indirect benefits to the economy. There are also other options that are becoming popular in financing crossborder infrastructure projects in Asia and elsewhere, such as equity financing for private infrastructure development, private bond placements, public bond placements, official aid financing, direct investment by national and Asian firms, foreign direct investment, and sovereign wealth fund. Various guarantees or subsidies are also used to share project risks. However, given the underdevelopment of the Asian financial markets outside a few key centers, financial infrastructure development is also needed to provide the appropriate type of investments for the full range of physical infrastructure projects.

[28] See, for example, Kuroda et al. (2007), Nag (2007), to mention a few.

Governments in Asia along with multilateral development organizations can play a greater role for development of crossborder infrastructure in the region. This is not to deny that exclusive dependence on government for the provision of all infrastructure services introduces difficulties concerning adequate scale of investment, technical efficiency, proper enforcement of user charges, and competitive market structure. Nonetheless, complete reliance on private production, particularly without an appropriate regulatory environment in force, is also not likely to produce optimal outcomes. Now, infrastructure investment is entering a new stage, marked by new operators and sources of capital, a redefining of the public sector's role, and new instruments for regulating and overseeing public services. The role of private sector, whether through PPP, or PSP, is thus very important in order to sustain crossborder infrastructure development in Asia.

Eliminating the gap in infrastructure financing for CBIPs is not all that is required. In order to attract large and medium-scale private investors, it is essential that Asian countries should set in place an effective and useful institutional mechanism to be operative at regional level. At the same time, countries have to continue domestic reforms which will encourage the private sector to invest in national infrastructure. A strong national infrastructure can only strengthen crossborder infrastructure since a large part of Asia is geographically contiguous. Contrary to popular belief, many Asian countries still do not have PPP policy, despite that fact that they are aggressively looking for private sector investment. Problems become more severe in smaller and LDCs where a lack of adequate capacity coupled with inadequate regulatory frameworks jeopardizes crossborder infrastructure development opportunities. There should be a regional binding with specific targets to adopt an exclusive PPP policy and transparent guidelines for regional and national infrastructure. Here, Korea's PPP policy and Latin America's IIRSA initiative could provide some good lessons for Asia.

At the same time, in order to unlock Asia's crossborder infrastructure development potential, it is important to encourage effective coordination among development partners and donor agencies like ADB, JICA, ESCAP, IDB, World Bank, USAID, and other partners who are directly and indirectly engaged in regional cooperation and developmental activities.

Finally, the need for a structured regional program for CBIPs is required not only to overcome the institutional constraints but also to finance and support crossborder projects among LDCs. Moreover, for many of these crossborder projects, there may be some gap in financial viability which the public sector may be invited to ease.[29] The current trend among investors in crossborder projects in Asia and South America shows that public sector investments have been much higher than private sector, even though there is wide variation in investment between the two regions. Therefore, we can not ignore the role played by the government and multilateral development organizations in financing and developing crossborder projects. The need is primarily of three types: institutional support, capacity building, and long-term finance. To manage these three primary objectives, an exclusive program and a fund to promote crossborder infrastructure under the aegis of ADB would pave the way for facilitating private sector investors in Asia, as would leveraging existing initiatives in GMS and other subregions.

[29] Here, we have example of India's Viability Gap Funding (VGF), which has been pursued for making an infrastructure project commercially viable. Pakistan has also introduced VGF in 2006. VGF or Grant means a grant one-time or deferred, provided under this Scheme with the objective of making a project commercially viable. See, Appendix 5, for further details.

APPENDIX 1

ADB/ADBI Definition of a Regional Infrastructure Project

A regional (also referred as crossborder or transnational) infrastructure project is defined as either an infrastructure project with activities spanning over more than one country or a national infrastructure project that has significant crossborder impact (e.g., building a road in a country that connects a neighboring country.)

Examples of national projects with crossborder impact include (i) international airports, (ii) national airports with significant international flights and passengers, (iii) power projects (e.g., hydro) for exporting power to neighbors, (iv) international seaport, and (v) roads connecting to seaport and airports.

The following set of indicators could be defined that demonstrate the regional nature of a project.

- A regional infrastructure project is one in which project planning, bidding, or financing is done on a multicountry basis, indicating that it is a unified project affecting multiple states. [Define it as technically indivisible (section 1 (2A) of the Trans-European Transport Network (TEN-T) guidelines). Note that multicountry bidding or financing is possible even for national projects.]
- Project implementation is done simultaneously in different countries/states, or with a specified sequencing in different countries. [Define it as action/construction on at least two sides of the border (section 1 (1) of the TEN-T guidelines).]
- Add a criteria based on section 1 (2B) of the TEN-T guidelines (joint commitment and common structure).
- Add a criteria based on section 2 of the TEN-T guidelines (agreement between member countries especially for the infrastructure that does not actually cross the border).
- Significant sales of goods or services output across regional borders can be considered a criterion. Twenty percent might be used. However, it is possible that if the good or service is critical in the recipient country, the project might be considered regional. For example, even though total crossborder usage might be limited, if a highly specialized hospital or medical facility in a neighboring country is critically important for other countries, there is a regional impact.

Source: Biswa Bhattacharya, Special Advisor to Dean and ADB/ADBI Flagship Study Coordinator, ADBI, Tokyo.

APPENDIX 2

(a)Year-wise Trend in Private Sector Investment in Infrastructure

Year	Total PSI	Crossborder PSI
	(US$ billion)	
1991	5.97	0.00
1992	12.59	0.00
1993	20.13	2.30
1994	31.00	0.00
1995	40.73	0.46
1996	57.84	0.92
1997	100.87	0.75
1998	92.24	3.75
1999	61.66	0.10
2000	85.15	0.85
2001	66.00	1.70
2002	54.36	0.00
2003	54.29	1.26
2004	66.53	0.00
2005	100.89	0.59
2006	111.83	0.40
Total	962.09	13.08

PSI = private sector investment

Source: Calculated based on World Bank PPI Database available at http://ppi.worldbank.org

(b) Trends in Private Sector Investment in Infrastructure by Regions

Year	AP	ECA	LAC	MENA	SSA	Total
	(US$ million)					
1991	3,217	268	2,489	0	0	5,974
1992	5,072	352	7,150	0	20	12,593
1993	10,655	852	5,664	2,927	31	20,129
1994	15,669	3,641	10,800	248	647	31,005
1995	19,419	8,144	12,372	70	723	40,728
1996	24,641	9,859	22,624	40	675	57,839
1997	34,490	13,407	45,337	4,736	2,900	100,870
1998	11,029	11,569	64,307	3,315	2,016	92,236
1999	12,970	9,101	33,996	2,793	2,795	61,656
2000	20,295	25,088	34,291	3,470	2,004	85,148
2001	15,507	13,266	28,911	4,320	3,995	65,999
2002	15,900	16,857	16,803	1,543	3,262	54,364
2003	20,977	11,912	13,914	1,895	5,593	54,291
2004	23,258	16,987	15,007	7,384	3,897	66,535
2005	30,690	35,930	18,468	7,069	8,737	100,894
2006	39,322	23,511	26,284	10,954	11,761	111,833
Total	303,113	200,745	358,416	50,764	49,057	962,095

Source: Calculated based on World Bank PPI database, available at http://ppi.worldbank.org

APPENDIX 3

(a) Number of Crossborder Infrastructure Public-Private Partnerships: 19902006

Region	Subsector	Financial closure	Type of PPP	Subtype of PPP	Project count
East Asia and Pacific	Electricity	1996	Greenfield project	BOT	2
	Natural Gas	1995	Greenfield project	BOO	1
	Natural Gas	1997	Greenfield project	BOO	1
Europe and Central Asia	Natural Gas	2001	Greenfield project	BOO	1
Latin America and the Caribbean	Electricity	1998	Greenfield project	Merchant	1
	Electricity	2000	Greenfield project	BOO	1
	Natural Gas	1996	Greenfield project	Merchant	1
	Natural Gas	1998	Greenfield project	BOT	1
	Natural Gas	1998	Greenfield project	Merchant	3
	Natural Gas	2000	Greenfield project	BOT	1
	Roads	1996	Greenfield project	BOT	1
Middle East and North Africa	Natural Gas	1993	Greenfield project	BOO	1
Sub-Saharan Africa	Natural Gas	2003	Greenfield project	BOO	1
	Natural Gas	2005	Greenfield project	BOT	1
	Railroads	1995	Concession	Rehabilitate, lease or rent, and transfer	1
	Railroads	2003	Concession	Rehabilitate, operate, and transfer	1
	Railroads	2006	Concession	Rehabilitate, operate, and transfer	1
	Roads	1997	Concession	Build, rehabilitate, operate, and transfer	1

PPP = Public-Private Partnerships

Source: Calculated based on World Bank PPI database, available at http://ppi.worldbank.org

(b) Investment in Crossborder Infrastructure: 1990–2006

Region	Primary sector	Type of PPI	Subtype of PPI	Investment year	Total investment commitments* (US$ million)
East Asia and Pacific	Energy	Greenfield project	BOT	1996	535.5
East Asia and Pacific	Energy	Greenfield project	BOO	1995	394
East Asia and Pacific	Energy	Greenfield project	BOO	1997	325
Europe and Central Asia	Energy	Greenfield project	BOO	2001	1700
Latin America and the Caribbean	Energy	Greenfield project	BOT	1998	2200
Latin America and the Caribbean	Energy	Greenfield project	BOT	2000	170
Latin America and the Caribbean	Energy	Greenfield project	BOO	2000	680
Latin America and the Caribbean	Energy	Greenfield project	Merchant	1996	350
Latin America and the Caribbean	Energy	Greenfield project	Merchant	1998	1550
Latin America and the Caribbean	Energy	Greenfield project	Merchant	1999	100
Middle East and North Africa	Energy	Greenfield project	BOO	1993	2300
Sub-Saharan Africa	Energy	Greenfield project	BOT	2005	590
Sub-Saharan Africa	Energy	Greenfield project	BOO	2003	1200
Latin America and the Caribbean	Transport	Greenfield project	BOT	1996	32
Sub-Saharan Africa	Transport	Concession	Build, rehabilitate, operate, and transfer	1997	426
Sub-Saharan Africa	Transport	Concession	Rehabilitate, lease or rent, and transfer	1995	63.3
Sub-Saharan Africa	Transport	Concession	Rehabilitate, operate, and transfer	2003	55.4
Sub-Saharan Africa	Transport	Concession	Rehabilitate, operate, and transfer	2006	404

PPI = Private Participation in Infrastructure
Source: Calculated based on World Bank PPI database, available at http://ppi.worldbank.org

APPENDIX 4

List of Private Sector Investors in Airports and Seaports in Asia

Country	Year	Project	Investment (US$ million)	Investors	Ownership (%)	Investor country	Multilateral
Cambodia	1995–2004	Pochentong International Airport	143.20	Muhibbah Engineering	30.00	Cambodia	IFC
				Vinci	70.00	France	
	2001–2004	Siem Reap International Airport (SRIA)	88.90	Muhibbah Engineering	30.00	Cambodia	IFC
				SUEZ	70.00	France	
	2006–2006	Sihanoukville International Airport	200.00	Muhibbah Engineering	30.00	Cambodia	IFC
		Total	**432.10**	Vinci	70.00	France	
PRC	1991–1997	Shekou Container Terminal	82.80	P&O Ports	22.50	UK	
				Swire Pacific Ltd.	17.50	Hong Kong, China	
	1992–1992	Nanhai Container Terminal	0.00	Hutchison Whampoa Ltd	..	Hong Kong, China	
	2002–2005	Xiamen New World Xiangyu Terminal	145.00	NWS Holdings Limited	50.00	Hong Kong, China	
	1993–1993	Shanghai Container Terminals (SCT)	120.00	Hutchison Whampoa Ltd	40.00	Hong Kong, China	
	1994–1994	Chiwan Kaifeng Container Terminal	14.20	Chiwan Wharf Holdings	50.00	N/A	
	1994–1994	Fuzhou International Airport - Phase I	270.00	Daya Mitra Ekasejati	..	Indonesia	
	1994–1994	Fuzhou International Airport - Phase II	150.00	Hume Industries	..	N/A	
	1994–1994	Ningbo - Van Ommeren Tank Terminal	10.00				
	1994–1994	Shantou Zhuchi Port	90.00	Hutchison Whampoa Ltd	..	Hong Kong, China	
	1997–1997	Zhuhai - Gaolan, Jiuzhou Ports	25.60	Hutchison Whampoa Ltd	..	Hong Kong, China	

PRC	1995–1995	Lanshang port	0.00	GATX Terminals Pte Ltd.	60.00	N/A	
	1995–1995	Xiamen Liquid Bulk Terminal	70.00	Daxin Petroleum (the PRC)	20.00	N/A	
				Paktank International B.V.	40.00	N/A	
	1996–1996	Dalian Container Terminal (DCT)	480.00	PSA Corp	..	Singapore	
	1996–1996	Xiamen Airport Development Co. Ltd.	113.30	Others	..	N/A	
	1996–1996	Xiamen Haicang Port	96.00	Hutchison Whampoa Ltd	49.00	Hong Kong, China	
	1996–1996	Xiamen, Dongdu, Berths 12,13,14	60.00	Fairyoung (Xiamen) Port Investments Ltd	16.30	N/A	ADB, IFC
				NWS Holdings Limited	43.70	Hong Kong, China	
	1996–1996	Yantian International Container Terminals	477.80	Hutchison Whampoa Ltd	73.00	Hong Kong, China	
	1997–2005	Changshu Xinghua Port Co. Ltd.	250.80	Macquarie Infrastructure Group (MIG)	38.00	Australia	
				Pan-United Corporation	51.30	Singapore	
	1998–1998	Dalian Marine Tank Terminal	30.00				
	1998–1998	Fuzhou Daijiang Minjiang Terminals	0.00	PSA Corp	34.30	Singapore	
	1998–1998	Shanghai Hongqiao Airport	231.90	Others	..	N/A	
	1998–1998	Shanghai Pudong Airport	225.00	Others	..	N/A	
	1998–1998	Shenzhen Airport	75.20	Others	..	N/A	
	1998–2005	Tianjin Port	272.00	DP World	24.50	UAE	
				NWS Holdings Limited	24.50	Hong Kong, China	

	1998–1998	Wuhan Yangluo Container Port	24.00	the PRC Infrastructure Group	56.10	the PRC	IFC
	1999–1999	Funing Airport Project	12.05	Suifenghe Bluesky Airport	..	the PRC	
	1999–1999	Jinzhou Port Co. Ltd.	29.40	Others	27.10	N/A	
	1999–1999	Shanghai-Pudong Airport Cargo Terminal	57.90	JHJ International Forwarding Co. Ltd.	20.00	the PRC	
				Lufthansa	29.00	Germany	
	1999–1999	Wuhan Airport	42.30	NWS Holdings Limited	30.00	Hong Kong, China	
	1999–1999	Zhapu Port Multi-Purpose Terminal	61.00	the PRC Infrastructure Group	33.00	the PRC	IFC
	2000–2000	Beijing International Airport	386.00	Others	..	N/A	
PRC	2000–2003	Qingdao Qianwan Container Terminal Co. Ltd.	1064.00	AP Moller - Maersk Group	20.00	Denmark	
				P&O Ports	29.00	UK	
	2000–2000	Shanghai Port Container Co. Ltd.	303.80	Others	..	N/A	
	2001–2001	Guangzhou Container Terminal	100.00	PSA Corp	49.00	Singapore	
	2001–2001	Xiamen Airport Cargo Terminal	27.17	Others	49.00	N/A	
	2002–2002	Hainan Meilan Airport	97.90	Copenhagen Airports	20.00	Denmark	
	2002–2005	Ningbo Beilun Port Phase II	391.55	Hutchison Whampoa Ltd	49.00	Hong Kong, China	
	2002–2002	Shekou Container Terminals - Phase II	205.40	Others	9.80	N/A	
				P&O Ports	22.00	UK	
				Swire Pacific Ltd.	17.20	Hong Kong, China	

	2002–2002	Yantian International Container Terminals Phase III	845.00	Hutchison Whampoa Ltd	65.00	Hong Kong, China	
	2003–2003	Shanghai East Container Terminal	0.00	AP Moller - Maersk Group	49.00	Denmark	
	2003–2003	Shanghai Pudong International Container Terminals Ltd	338.16	Hutchison Whampoa Ltd	30.00	Hong Kong, China	
	2004–2004	Guangzhou Baiyun Airport	0.61	Keppel Group	25.00	Singapore	
	2004–2004	Jingtang International Container Terminal	35.30	ACS Group (Actividades de Construccion y Servicios)	52.00	Spain	MIGA
	2004–2004	Xiamen Songyu Container Terminal	364.25	AP Moller - Maersk Group	50.00	Denmark	
	2004–2006	Yangkou Port	54.00	Paul Y.-ITC Construction Holdings	67.70	N/A	
PRC	2004–2004	Yantian Westport Container Terminal	12.30	Hutchison Whampoa Ltd	41.60	Hong Kong, China	
	2005–2005	Deqing Wuxin Line Water Canal Operation Co. Ltd.	47.00	Isyoda Corp. Bhd.	70.00	Malaysia	
	2005–2005	Phase II of Shanghai's Yangshan Mega-port Project	482.00	AP Moller - Maersk Group	32.00	Denmark	
				Hutchison Whampoa Ltd	32.00	Hong Kong, China	
	2005–2005	Shanghai Waigaoqiao Phase V Project	482.00	Hutchison Whampoa Ltd	50.00	Hong Kong, China	
	2005–2005	Shenzhen Dachan Bay Container Terminals	858.00	Modern Terminals Ltd.	65.00	Hong Kong, China	
	2005–2005	Tianjin Five Continents International Container Terminal Co. Ltd.	287.30	NWS Holdings Limited	18.00	Hong Kong, China	
	2005–2005	Zhuhai Gaolan Port New Container Terminals (Zhuhai International Container Terminal Phase II)	230.28	Hutchison Port Holdings	50.00	Hong Kong, China	

PRC	2006–2006	Beilun Terminal Phase 4 Project	198.00	Italia Maritima Spa	50.00	Italy	
	2006–2006	Dalian Port	316.67	Others	30.00	N/A	
	2006–2006	Hangzhou Xiaoshan International Airport	713.43	Airport Authority of Hong Kong, China	35.00	Hong Kong, China	
	2006–2006	Huizhou Port	188.21	Hutchison Port Holdings	33.60	Hong Kong, China	
	2006–2006	Nansha Port Phase II	503.14	AP Moller - Maersk Group	20.00	Denmark	
	2006–2006	Tianjin Port Development	139.74	Others	34.00	N/A	
	2006–2006	Wenzhou Zhuangyuan Ao New World International Terminals	175.00	NWS Holdings Limited	55.00	Hong Kong, China	
	2006–2006	Zhuhai airport concession	45.17	Airport Authority of Hong Kong, China	55.00	Hong Kong, China	
		Total	**12407.63**				
Indonesia	1995–1995	Balikpapan Coal Terminal	50.00	PT Dermaga Perkasa Pratama	..		
	1995–1995	Pulau Laut	110.00	Consolidated Bulk Handling	..		
		Total		PT Swabara Bumi	..		
				PT Tritamas Majutama	..		
	1995–1995	Tanjung Priok Koja Container Terminal	111.10	PT Humpuss Terminal Petikemas	N/A		
	1999–1999	PT Jakarta International Container	555.00	Hutchison Whampoa Ltd	51.00	Hong Kong, China	
	1999–1999	Tanjung Perak Container Terminal	473.00	P&O Ports	..	United Kingdom	
	2003–2003	Terminal Petikemas Makassar (TPM)	0.00	International Container Terminal Services Inc. (ICTSI)	95.00	Philippines	
		Total	**1299.10**				

Lao PDR	2000	Vientiane Airport Terminal		JAL Trading	24.50	Japan	
	2000	Vientiane Airport Terminal		Tomen Corp.	24.50	Japan	
Malaysia	1992–1997	Klang North Port	215.60	Northport Corp. Bhd.		N/A	
	1997–2001	Lumut Port	126.40	Integrax	80.00	N/A	
				Malakoff Bhd	20.00	Malaysia	
	1993–1993	Malaysia-Singapore Second Crossing (Second Crossing Bridge; Second Crossing Expressway; Perling Expressway)	111.00	United Engineers (Malaysia) Berhad	..	Malaysia	
	1994–1994	Klang Westport	540.00	Hutchison Whampoa Ltd	..	Hong Kong, China	
				Pembinaan Redzai Sdn Bhd	..	N/A	
	1995–1995	Johor Port	0.00	MMC Corporation Bhd.	51.70	Malaysia	
	1995–1995	Tanjung Pelepas Port	736.00	AP Moller - Maersk Group	..	Denmark	
				Seaport Terminal (Johore) Sdn Bhd	..	N/A	
	1997–1997	Kerteh Liquid Bulk Terminal	107.00	Dialog MCV Sdn Bhd	..	N/A	
				GATX Terminals Pte Ltd.	..	N/A	
	1997–1997	Kuantan Port	214.00	Road Builder (M) Holdings Sdn Bhd	100.00	N/A	
	1999–1999	Malaysia Airports Holdings Bhd.	130.00	Others	..	N/A	
	2003–2003	Senai International Airport	281.00	Senai Airport Terminal Services Sdn Bhd	100.00	N/A	
	2004–2004	Sabah Ports Sdn Bhd	342.11	Suria Capital Holdings Bhd	100.00	Malaysia	
	2006–2006	Kemaman Port East Wharf Privatization	13.00	Eastern Pacific Industrial Corp Bhd	61.00	Malaysia	
		Total	**2816.11**	Road Builder (M) Holdings Sdn Bhd	39.00	N/A	

Myanmar	1996	Thilawa Container Terminal	50.00	Hutchison Whampoa Ltd	80.00	Hong Kong, China, the PRC	
Philippines	1997–1997	Manila South Harbour	471.70	All Asia Capital & Trust Corp.	..	Philippines	
				Mitsui	..	Japan	
				P&O Ports	..	United Kingdom	
		Manila North Harbour		International Container Terminal Services Inc. (ICTSI)	..	Philippines	
	1999–1999	Bauan Terminal	78.30	Bauan International Port, Inc. (BIPI)	40.00	Philippines	
				International Container Terminal Services Inc. (ICTSI)	60.00	Philippines	
	2000–2000	Subic Bay Terminal	4.90	International Container Terminal Services Inc. (ICTSI)	..	Philippines	
				Royal Ports Services Inc.	..	Germany	
	2001–2001	Subic Bay Grain Terminal	10.60	Mega Equipment International Corp.	100.00	Philippines	
	2002–2002	Eva Macapagal Super Terminal	30.10	Asian Terminal, Inc.	100.00	Philippines	
		Total	**595.60**				
Thailand	1990–1990	Laem Chabang Terminal B 3	0.00	Kamigumi Co.	..	Thailand	
				Marubeni Corp.	..	Japan	
	1990–1990	Laem Chabang Terminal B 4	0.00	Mitsui	..	Japan	
				Ngow Hock Group	..	N/A	
				NYK Line	..	Japan	
	1991–1991	Sukhothai Airport	15.70	Bangkok Airways	..	Thailand	

Thailand	1992–1992	Map Ta Phut	48.00	Paktank International B.V.	49.00	N/A	
	1993–1993	Laem Chabang Terminal A4	0.00	Aawthai Warehouses Co.	..	Thailand	
	1993–1993	Laem Chabang Terminal B 2	0.00	Evergreen Marine Corp	..	Taipei,China	
				Green Siam Co.	..	Thailand	
	1995–1995	Laem Chabang Terminal B 1	0.00	Laem Chabang International Terminal Co. Ltd.	..	Thailand	
	1996–1999	Laem Chabang Terminal B 5	32.00	Laem Chabang International Terminal Co. Ltd.	..	Thailand	
	1998–1998	Laem Chabang Terminal A5	27.40	Banpu Public Company	100.00	Thailand	
	1999–1999	Laem chabang Terminal A2	31.73	Ban Saen Mahanakorn Ltd.	..	Thailand	
				Hutchison Whampoa Ltd	88.00	Hong Kong, China	
	2001–2001	Laem Chabang Terminal A1	15.00	Star Cruises	100.00	Malaysia	
	2003–2003	Laem Chabang Terminal C3	45.00	P&O Ports	..	UK	
	2004–2004	Airports of Thailand	439.00	Others	30.00	N/A	
		Total	**653.83**				

Viet Nam	1994–1997	Phu My Port	30.00	Norsk Hydro		Norway	IFC
				Southern Crop Production Association (SCPA)		N/A	
	1996–1996	Ho Chi Minh City Airport Cargo Services	15.00	Singapore Airport Terminal		Singapore	
	1997–2002	Tan Thuan Dong container port	70.00	Mitsui		Japan	
				Neptune Orient Lines		Japan	
		Total	**115.00**				
Bangladesh	1998–1998	Jamuna Bridge - First management contract		Abdul Monem	..	Bangladesh	ADB
				Group Five	75.00	South Africa	IBRD
				Owen Williams	..	UK	
	2004–2004	Jamuna Bridge		Net One Ltd	..	Bangladesh	
				PT Jasa Marga	..	Indonesia	
	2005–2005	Shah Amanat (Chittagong) International Airport		Thai Airways International Public Company Limited	100.00	Thailand	
India	1994–1994	Cochin International Airport	125.00	Others	..	N/A	
	1997–1997	Pipavav Port	178.30	PSA Corp	22.50	Singapore	
				Seaking Engineers Ltd.	37.00	N/A	
	1996–2006	Mundra Port	439.07	Adani Group	51.00	India	
	1997–1997	Nhava Sheva International Container Terminal	200.00	DP World	49.00	UAE	
				Konsortium Perkapalan Berhad	46.00	Malaysia	

	1998–1998	Tuticorin Container Terminal	127.00	PSA Corp	57.50	Singapore	
				South India Corporation	37.50	India	
	1999–1999	Dahej Liquid Chemical Port	203.10	Indian Petrochemical Corporation Limited	30.00	India	
	1999–1999	Navlakhi port	2.00	United Shippers	100.00	India	
	1999–1999	Kakinada Port	72.00	Larsen & Toubro Limited	..	India	
				Precious Shipping Ltd.	..	Thailand	
				Stevedoring Services of America (SSA) Inc.	33.00	United States	
	2001–2001	Chennai Container Terminal Pvt Ltd	100.00	Chettinad Group	20.00	India	
India				DP World	75.00	UAE	
	2001–2001	Mundra International Container Terminal	120.00	DP World	100.00	UAE	
	2002–2002	Visakhapatnam Container Terminal	62.40	DP World	50.00	UAE	
				United Liner Agencies	50.00	India	
	2003–2003	Haldia Dock Complex (4A Berth)	23.00	ISP Singapore	67.00	Singapore	
				S.S. Global	33.00	UAE	
	2003–2003	Mormugao Port	20.60	ABG Heavy Industries Ltd.	100.00	India	
	2004–2004	Gateway Terminals India Private Limited (GTI)	220.65	AP Moller - Maersk Group	74.00	Denmark	
	2005–2005	Bangalore International Airport Limited	324.20	Larsen & Toubro Limited	17.00	India	
				Siemens AG	40.00	Germany	
				Unique (Flughafen Zurich)	17.00	Switzerland	

India	2005–2005	Gangavaram Port Limited	385.50	DP World	..	UAE	
				DVS Raju	..	India	
	2005–2005	GMR Hyderabad International Airport Limited	399.10	GMR Group	63.00	India	
	2005–2005	Rajiv Gandhi Container Terminal	0.00	DP World	75.00	UAE	
	2006–2006	ABG Kandla Container Terminal Limited	45.50	ABG Heavy Industries Ltd.	100.00	India	
	2006–2006	Chhatrapati Shivaji International Airport	1,313.00	Bidvest Group	27.00	South Africa	
				GVK Group	37.00	India	
	2006–2006	Indira Gandhi International Airport	1225.00	GMR Group	50.10	India	
	2006–2006	Karaikal Port	92.00	Marg Constructions Limited	100.00	India	
	2006–2006	Krishnapatnam Port Company Limited	143.50	Natco Pharma Limited	26.00	India	
				Navayuga Group	74.00	India	
	2006–2006	Vallarpadam International Container Transhipment Terminal - Phase I	200.00	DP World	75.00	UAE	
		Total	**6,020.92**				

Pakistan	1995–2005	Pakistan International Container Terminal	144.00	Premier Mercantile Services Ltd.	41.00	Pakistan	IFC
	1995–1995	Port Mohammed bin Qasim Liquid Bulk Terminal	65.00	Engro Chemical Pakistan Ltd.	50.00	N/A	
				Paktank International B.V.	50.00	N/A	
	1995–1995	Qasim International Container Terminal	134.60	AP Moller - Maersk Group	20.00	Denmark	
				DP World	55.00	UAE	
	1997–2003	Karachi - International Container Terminal	148.70	American President Lines		N/A	IFC
				International Container Terminal Services Inc. (ICTSI)		Philippines	
	2006–2006	Second Container Terminal at Port Mohammad Qasim	211.00	DP World	100.00	UAE	
	2006–2006	Sialkot International Airport	40.00	Others	100.00	N/A	
		Total	**743.30**				
Sri Lanka	1999	Colombo Port (SAGT)	240.00	DP World	26.20	UAE	ADB
				John Keels Holdings Ltd.	33.70	Sri Lanka	IFC

Source: World Bank PPI database, available at http://ppi.worldbank.org

APPENDIX 5: VIABILITY GAP FUNDING IN INFRASTRUCTURE PROJECTS IN INDIA

An investment of about US$500 billion would be required in the infrastructure sector during the Eleventh Five-Year Plan (2007–2011). These investments are to be achieved through a combination of public investment, public-private-partnerships (PPPs), and exclusive private investments, wherever feasible. Viability Gap Funding (VGF) or Grant means a grant, one-time or deferred, provided under this Scheme with the objective of making a project commercially viable. The total VGF under the PPP scheme of the Government of India shall not exceed 20% of the total project cost; provided that the Government or statutory entity that owns the project may, if it so decides, provide additional grants out of its budget, but not exceeding a further 20% of the total project cost. The VGF is normally in the form of a capital grant at the stage of project construction. Proposals for any other form of assistance may be considered by the Empowered Committee and sanctioned with the approval of Finance Minister on a case-by-case basis. The VGF up to Rs1 billion (about US$25 million) for each project is sanctioned by the Empowered Institution (here through IIFC), subject to the budgetary ceilings indicated by the Finance Ministry. The Empowered Committee is also entitled to sanction VGF up to Rs2 billion, depending upon the project feasibility, and amounts exceeding Rs2 billion may be sanctioned by the Empowered Committee with the approval of Finance Minister.

Source: Planning Commission, Government of India

APPENDIX 6

(i) India–Myanmar– Thailand Trilateral Highway

India–Myanmar–Thailand Trilateral Highway (IMTTH) is a crossborder transportation network being financed by the governments of India, Myanmar, and Thailand, and developed by the pubic sector. This highway links Moreh (in India) with Mae Sot (in Thailand) through Bagan (in Myanmar), which is often termed a land bridge between South and Southeast Asia. The alignment of this trilateral highway falls within the Asian Highways 1 and 2, being pursued by ESCAP (De 2005).

The IMTTH is divided into three phases; the first phase includes 78 km of new roads, upgrading of about 400 km of roads, construction of all-weather approach lanes, rehabilitation/ reconstruction of weak or distressed bridges and a detailed examination of a project on the Ayeyarwaddy river as well as a causeway. The entire project is being funded through government resources. Phase-I of the IMTTH was taken up in early 2005. India assumes responsibility of 78 km of missing links and 58 km of upgrading as part of Phase-I. India may also take up additional 132 km of upgrading. Thailand would take up upgrading of 136 km and 62 km sectors of Phase-I and another 100 km as part of Phase-II. Myanmar has indicated willingness to take up intermediary approach roads and reconstruction/ rehabilitation of weak bridges.

India has agreed to offer credit at concessional terms to Myanmar for financing new constructions of Chaungma–Yinmabin (30 km) and Lingadaw–Letsegan–Pakokku (48 km.) highways. India has also agreed to consider similar financing for improvement to two–lane standard of the Yinmabin–Pale–Lingadaw (50 km) road section inside Myanmar. Further, India has agreed to consider financing of the improvement of the Bagan–Meiktila (132 km.) segment in Myanmar. India has also agreed to undertake the preparation of a Detailed Project Report (DPR) for construction of a bridge on the Ayeyarwaddy river and for the causeways near Kyadet. Thailand has agreed to extend concessional loans for financing the improvement to two-lane standard of the Thaton–Hpa–an–Kawkareik section (136 km) and Kawkareik–Myawaddy section (62 km). These sections are part of the western side of the East-West Economic Corridor in GMS between Myanmar and Thailand. Thailand has also agreed to assist Myanmar in financing of the route Thaton–Mawlamyine–Mudon–Kawkareik as a second phase of the project. Myanmar has agreed to finance construction of all-weather intermediate lane approach roads at both ends from Pakokku to Bagan up to the existing ferry crossing and the rehabilitation/reconstruction of distressed and weak bridges. Myanmar has decided to explore the possibility of important commercial segments of the highway being constructed, operated, and maintained by operators on a commercial basis.

The Indian government–owned Border Roads Organisation (BRO) had upgraded the Tamu–Kalewa–Kalemyo (TKK) road (160 km) in Myanmar from the Indian northeastern border at a cost of Rs. 1.20 billion (about US$27.28 million). The Government of India is also responsible for upkeep of the TKK road in Myanmar. However, the work has been stalled since 2006, due mainly to political reasons. Lack of essential institutional support and government commitments are some of the reasons for slowing down the development of this trilateral highway. It has been argued that deeper regional cooperation among the three countries (perhaps within BIMSTEC) would help restart the development of the trilateral highway.

(ii) Indonesia–Malaysia Gas Pipeline

The Indonesia–Malaysia gas pipeline runs from West Natuna, an offshore reserve in the South the PRC Sea, to Duyong, Malaysia. In August 2002, Indonesia began delivering 250 Mmcf/d of piped natural gas to Malaysia's Duyong platform. This crossborder pipeline was

developed at an investment of US$22 million through PPP and has been working successfully.

(iii) Malaysia–Thailand Gas Pipeline

The origin of the project dates back to 1979, when the governments of Thailand and Malaysia signed a memorandum agreeing to explore the possibilities of jointly developing the gas reserves in the Joint Development Area (JDA) in Gulf of Thailand. Malaysia has one of the most extensive natural gas pipeline networks in Asia, owing to the multiphased Peninsular Gas Utilization (PGU) project that was completed in 1998. The goal of the PGU was to expand natural gas transmission infrastructure in Peninsular Malaysia.

The Malaysia–Thailand Gas Pipeline (Trans–Thailand–Malaysia Pipeline) is an ongoing joint project between Petronas, Malaysia and Petroleum Authority of Thailand. Both the companies have set up a Special Purpose Vehicle, namely, Trans–Thai-Malaysia Ltd (TTM), which is the developer of the Thai-Malaysia Gas Pipeline project. The 374 km gas pipeline project comprises a 277 km offshore section and 97 km onshore section. The pipeline will transport gas from the Malaysian–Thai Joint Development Area (JDA) to the Peninsular Gas Utilization pipeline at Changlun in Kedah, Malaysia. This linkage will mark a major step towards realizing the Trans-ASEAN Gas Pipeline (TAGP). Despite several social and political problems, construction of the pipeline started in 2003 and was completed in 2007.

Malaysia–Thailand Joint Development Area

The JDA is an overlapping economic zone located offshore between Malaysia and Thailand in the Gulf of Thailand. The Joint Development Area was established to resolve the overlapping claims between Malaysia and Thailand over the hydrocarbon resources in the area. The area is divided into three blocks, namely, Block A-18, Block B-17 and Block C-19, and is administered by the Malaysian-Thailand Joint Authority (MTJA), of which Malaysia and Thailand each owns 50%.

Through MTJA, both countries agreed to adopt Malaysia's model of the production sharing contract (PSC). The production sharing contractors for Block A-18 are Petronas Carigali (JDA) Sdn Bhd, a wholly owned subsidiary of Petronas Carigali, and Triton Oil Company of Thailand; while the contractors for the other two blocks, Block B-17 and Block C-19, are Petronas Carigali (JDA) Sdn Bhd and Carigali-PTTEP International Operating Company (CPOC).

Petronas and Petroleum Authority of Thailand have concluded the gas sales and purchase agreement for Block A-18. Under the agreement, Petronas and Petroleum Authority of Thailand will buy gas from the Joint Development Area on a 50:50 basis and then bring their respective share of gas back to Malaysia and Thailand. Gas purchases from Block A-18 are expected to amount to 390 million standard cubic feet per day.

This Thailand–Malaysia gas pipeline is one of the seven gas pipeline interconnections identified to be developed under the TAGP project of ASEAN. It is expected to link all the 10-member countries of the Association of South-East Asian Nations by the end of the decade.

(iv) Malaysia–Singapore Gas Pipeline

Malaysia and Singapore have two gas pipelines in operation (Figure 10)—one was set up in 1991, the oldest in ASEAN, and the other in 2006. The first pipeline, developed through PPP at a cost of US$260 million, delivers about 150 million standard cubic feet per day (scf/d) from Malaysia to Singapore, whereas a second pipeline of about 6 km. long was set up through PPP at a cost of US$17 million in 2006.

Singapore's Senoko Power currently imports 155 million cubic feet per day (Mmcf/d) of natural gas through the first pipeline from Petronas, Malaysia. The Senoko-Petronas deal expired in mid-2008. In June 2005, Singapore’s Keppel Energy reached an agreement to

purchase 115 Mmcf/d of natural gas over 18 years from Petronas. To transport the natural gas, Keppel and Petronas have completed a 3-mile pipeline between Plentong in the southern Malaysian state of Johor to the Senoko area in the north of Singapore, which is called as Malaysia–Singapore second gas pipeline. However, the Plentong pipeline will have a capacity to transport up to 290 million ft^3/day of natural gas, which could provide for increased sales of natural gas to Singapore in the future.

(v) Houay Ho Hydropower, Lao PDR

Houay Ho (HH) hydropower project was set up at an investment of US$220 million to develop a 150 MW hydroelectric power plant on the Houay Ho river in Lao PDR under BOT agreement with the Lao PDR Government to generate and export electricity to Thailand.

Houay Ho Power Company (HHPC) is an independent power producer (IPP) established in 1996 to operate this project. The project was originally funded and undertaken by Daewoo Engineering/Construction Company of Korea as an EPC Contractor in 1993, following a 30-year BOT Agreement with the Government of Lao PDR to exploit hydroelectric resources in Lao PDR. The project was later transferred to SUEZ Energy International and Houay Ho Thai Company Limited in 2002. With this acquisition, SUEZ Energy International has become one of major players in electric power industry sector in Lao PDR. The current investors are as follows:

- SUEZ Energy International, France: 60%,
- EDL, Lao PDR: 20%
- HHTC, Lao PDR: 20%.

Both BOT and Power Purchase Agreement became effective from 1999 for a period of 30 years. The plant was commissioned successfully in September 1999, and has served the PPA with EGAT, Thailand faultlessly ever since. The HH project has provided employment opportunities to the local people, besides providing taxes, royalties and export earnings to Lao PDR government. According to HHPC, during construction, it has provided 325 jobs for Lao citizens, most of them taken by local people (Ban Nam Han village and immediate surroundings), of which 84 jobs for Lao citizens were permanent in nature (available at http://www.houayho.com).

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