Analyzing Asian Infrastructure Development Privatization Market

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Abstract: Concession agreement is one of the infrastructure privatization models. In Asia, the rise of concession projects began in the 1980s, and the number of such projects continues to grow. This research provides an overview and detailed analysis of the Asian concession market. Eighty-seven concession projects awarded between 1985 and 1998 covering 12 Asian countries were examined. Findings show that Asia has been implementing concession models actively in response to the high demand of infrastructure development in the power, transportation, and water sectors. Approximately 30% of the total concession projects had disappointing performances resulting in financial loss, cancellation, delay, and suspension of the project.

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Introduction

Infrastructure privatization model attracts private investment and management to implement infrastructure development projects. Many developed and developing nations have been promoting concession agreement to supplement greatly needed infrastructure services under tight budgetary constraints. Concession agreement is one of the infrastructure privatization models that trace back to the mid-19th century in Europe (Lazonick 1990). Concession agreement reemerged in the early 1980s as a major institutional project delivery approach of infrastructure privatization.

Asia also joined the global infrastructure development privatization trend. The rise in Asian concession projects began in the late 1980s and continues to grow. Over the past decade, the number of Asian concession projects increased remarkably, exceeding 150 projects by 1995 (Chatterjee 1996). The reduced expenditure on public works among many Asian governments provided more opportunities for the private sector to participate in concession infrastructure development.

For this research, 87 concession projects awarded between 1985 and 1998 covering 12 Asian countries have been analyzed. The total value of 87 concession projects sums to about $67.8 billion. This paper primarily used Cho's (1999) database for the sources of the descriptive data, statistics, and information of 87 concession projects. Cho's (1999) data were further collected and compiled by: (1) direct interviews and discussions with experts in concession development from multinational institutions (i.e., the World Bank and the Asian Development Bank), international contractors, and educational institutions; (2) various journals covering concession news and events; and (3) secondary sources from numerous published articles containing the relevant references (Tiong 1992, 1995a, b; Tiong et al. 1992; Huang 1995).

The purpose of this paper is to provide an overview of the Asian concession market based on the analysis of 87 concession projects. First, the paper examines the distribution of the Asian concession market by four country groups, classified by income (World Bank 1997a). Then, the paper provides a breakdown of the Asian concession market by three major sectors (water, transportation, and power) of the infrastructure industry and by the nationality of developers. Next, the paper analyzes the success and problems of Asian concession projects and evaluates their main causes, classified by countries. Finally, the paper discusses major findings and lessons learned from the analysis of Asian concession markets.

Infrastructure Privatization and Concession Agreements

The practices of delegating public duties to private sectors have become a worldwide trend to restrict deficit-generating government expenditure. This trend has been disseminated in infrastructure development, leading to infrastructure privatization. Infrastructure privatization holds a broader meaning than just the sale of weak public enterprises to the private sector. Within this context, infrastructure privatization is defined as ''sale or transfer of any asset, organization, function, activity, responsibility, or right associated with the process of infrastructure project development form the public sector (e.g., government and its agencies) to the private sector.''

The concession model is one of numerous alternatives for infrastructure privatization. A concession agreement can be defined as ''an arrangement whereby a private party leases assets for service provision from a public authority for an extended period and has responsibility for financing specified new fixed projects during the period. The new assets revert to the public sector at expiration of the contract'' (World Bank 1994).

The term ''concession'' is extended to three major issues in this research. First, the concept of financing in concession embraces a wider meaning than a simple payment for the lease of

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Table 1. Classification of Economies by Income: 12 Sampled Countries in Asia

Country group	Sampled Asian countries
High income economies (HIE)	Hong Kong (4), Australia (4), Taiwan (1)
Upper middle income economies (UMIE)	Malaysia (11)
Lower middle income economies (LMIE)	Indonesia (5), Philippines (17), Thailand (7)
Low income economies (LIE)	China (17), Pakistan (8), Vietnam (5), India (6), Nepal (2)

Note: Numbers in parentheses indicate number of concessions in each nation.

government assets. It expands to a point where private concessionaires may obtain the development right of the project as well as the property right. Second, the concession period can be extended indefinitely without a fixed expiration date as in the case of build-operate-own (BOO) or rehabilitate-operate-own (ROO) projects. Third, besides tangible assets, public organization, functions, activities, or rights can be leased, sold, or transferred to the private sector.

In the concession model, the private sector is involved from planning, investment, and construction to the management of operation. The concession model is distinguished from the sale of government assets by the fact that it includes the activities of building the physical facilities. The concession model is particularly attractive for developing countries' governments that have an urgent need for the infrastructure services, yet hold little capital to finance large projects.

Asian Market Concession Market Analysis

By Country Groups

Market analysis by country groups allows us to understand in which economies the private sector wants to invest and which governments provide a better business environment to attract private involvement in infrastructure development. It also helps to foresee the direction of future concession development in Asia. Twelve nations in Asia were classified into four groups according to the *World Development Basic Indicators* (World Bank 1997a): (1) high income economies (HIE); (2) upper middle income economies (UMIE); (3) lower middle income economies (LMIE); and (4) low income economies (LIE). Table 1 classifies twelve Asian nations into four different economies.

Fig. 1 presents the distribution of the Asian concession market by different income economies based on the value of total concessions. It shows that LMIE and UMIE have awarded 46% of the total value $67.8 billion. Next, LIE have followed with 31%, and HIE have shared with 23%. Based on the distribution, MIE have been the most active in tapping private capital investment through the concession model in Asia.

This distribution is somewhat different from the results of a study on the world build-operate-transfer (BOT) market (Huang 1995). In Huang's (1995) analysis, worldwide HIE concession value has been the largest, accounting for 51% of the total BOT value awarded during 1983–1995. Two major factors can explain this disparity between the Asian and world markets. First, from a global perspective, a large number of HIE in Europe and North America, where the concept of modern infrastructure privatization emerged and was developed in the 1980s, have actively implemented concession models for their infrastructure development. Conversely, Japan, the biggest HIE in Asia, has not promoted any solid concession projects yet as of 1997. Recently, some HIE in Asia, including Japan, realized the significance of the private sector's role in infrastructure development; therefore, actual projects among HIE are forecasted to grow. Second, the world analyses were based on projects awarded by 1995. However, the number of the concessions has skyrocketed in many MIE, as witnessed in the Asian analysis from 1996 to first quarter of 1998.

By Power, Transportation, and Water Sectors

Three areas of social infrastructure were analyzed on this research: the power, transportation, and water sectors. The telecommunication sector was not included in the analysis because it has been developed primarily through the sale of government enterprises rather than by BOT-type concession models. Fig. 2 breaks down the Asian concession market in detail by three sectors. Based on the breakdown, transportation and power projects have accounted for slightly over 90% of the total concession value in the Asian region. The experience of concession projects in the water sector has been relatively limited. The following subsection discusses each sector in detail.

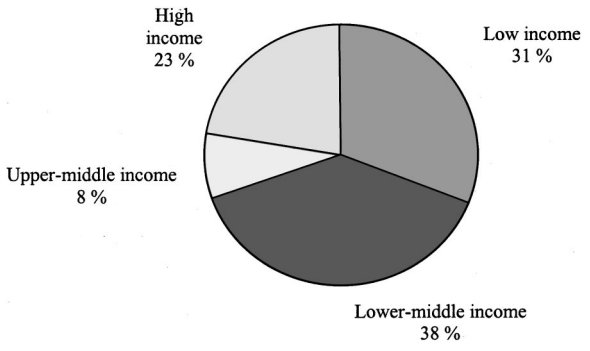

Fig. 1. Typical relationships between principal participants in BOT-type procurement

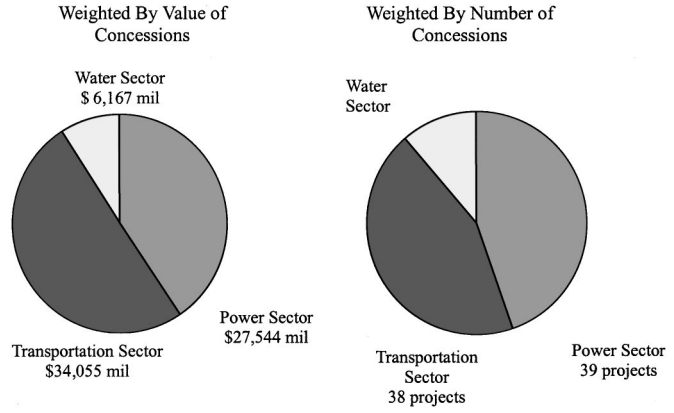

Fig. 2. Asian concession market distribution by infrastructure sector

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Table 2. List of 39 Power Concession Projects in Asia

Project name	Country
PT Paiton Power	Indonesia
PT Jawa Power	Indonesia
Navotas Power	Philippines
San Juan Power	Philippines
Batangas Power	Philippines
San Roque Power	Philippines
Limay Bataan Power	Philippines
Mindanao Power	Philippines
Iligan Power	Philippines
Tangshan Power	China
Shajio C Power	China
Paqi Power	China
Uch Power	Pakistan
Fauji Kabirwala Power	Pakistan
Sidnai	Pakistan
Vung Tau Power	Vietnam
Balagaph Power	India
Dabhol Power	India
Upper Bhotakoshi Power	Nepal
Tri Energy	Thailand
Jati B Power	Indonesia
Benguet Power	Philippines
Pagbilao Power	Philippines
Leyte Power	Philippines
Subic Bay Power	Philippines
Cavite Power	Philippines
Makban Biary Power	Philippines
Bauang La Power	Philippines
Laibin B Power	China
Shajio B Power	China
Guangzhou Zhujiang	China
Collie Power	Australia
Hub River Power	Pakistan
Raiwind Power	Pakistan
Tapal	Pakistan
Quang Nihn Power	Vietnam
Mangalore Power	India
Himal Power	Nepal
Coco Power	Thailand

Table 3. List of 38 Transportation Concession Projects in Asia

Project name	Country
Eastern Harbor crossing	Hong Kong
Western Harbor Crossing	Hong Kong
IBT Coal Port	Indonesia
New Pantai Highway	Malaysia
North-South Expressway	Malaysia
KL Light Rail Transit (LRT2)	Malaysia
Labuan-Beaufort Interconnection	Malaysia
Metro Rail Transit	Philippines
Sydney F4 Freeway	Australia
Sydney Harbor Tunnel	Australia
Huizhou City Road	China
Yichang Toll Bridge	China
Guangzhou Ring Road	China
Shunde Roads	China
BERTS Elevated Rail Road	Thailand
Bangkok Sky Train	Thailand
Indus Pipeline	Pakistan
Vung Tau Sea Port	Vietnam
Madhya Pradesh Durg Bypass	India
Tate's Carin Tunnel	Hong Kong
Cikampek-Padalarang Toll	Indonesia
Malaysia-Singapore 2nd Rd	Malaysia
Kuala Lumpur Interchange	Malaysia
KL Light Rail Transit (LRT1)	Malaysia
Lumut Maritime Port	Malaysia
KL PRT	Malaysia
Taiwan High Speed Rail	Taiwan
Sydney F5 Freeway	Australia
Wuhan Urban Expressway	China
Roadway Section Highway	China
Guangzhou-Zhuhai Highway	China
Boca Tigris Bridge	China
Putra Light Rail System	Thailand
2nd Bangkok Expressway	Thailand
Don Muang Tollway	Thailand
Fauji Oil Terminal	Pakistan
Coimbatore Road	India
Narmada Bridge	India

Power Sector

Concession models have played a significant role in supplying huge electrical power demands in Asia, where there is a short supply in electricity. These privately developed power station projects are referred to as ''independent power projects.'' A total of 39 concession power projects have accounted for $27,544 million, averaging $706 million per project. Power sector is divided into generation, distribution, and transmission. The portion of power generation in concession projects outweighed distribution and transmission, because generation facilities can be easily unbundled from existing integrated power networking utilities. The typical generation types include fuel-fired (e.g., coal, diesel, and natural gas), hydro, and geothermal. There were no nuclear power concession projects reported in Asian concession market analysis. Table 2 shows a list of 39 concession power projects and the country distribution.

Transportation Sector

The transportation sector can be categorized into toll roads with bridges, tunnels, and rest areas; railways; urban transport systems such as light rail transit (LRT), people-moving transit or subways; multipurpose terminals; fuel transport pipelines; and seaports. A total of 38 concession transportation projects have accounted for $34.055 million with the average of $639 million per project, excluding Taiwan's High Speed Rail (HSR) project. The value of HSR is estimated at $10,400 million and is expected to be one of the most expensive concession transportation projects in the world when it completes in 2003. Transportation project development has been well distributed over all different country groups, as presented in Table 3.

Water Sector

The water sector is divided into water supply and sewage, sanitation, and irrigation. The experience of concession projects in water sector is limited and less marketable as compared with power and transportation sectors, due to environmental issues that

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Table 4. List of 10 Water Concession Projects in Asia

Project name	Country
Chemical Waste Treatment	Hong Kong
Selangot Water Supply	Malaysia
MWSS Water Concession	Philippines
Da Chang Water	China
Thu Duc Water Sanitation	Vietnam
Labuan Water Supply	Malaysia
Casecnan Irrigation	Philippines
Chengdu Water Supply	China
Zhongshan Water	China
Bihn An Water	Vietnam

require strong government intervention. Water in Asia has been regarded as a fundamental commodity available free of charge to human daily life, as compared with electricity or transportation networks. As a result, private investment is difficult to redeem without the substantial price increases that cause social resistance and additional government control.

Nevertheless, the prospects of future water concession projects are optimistic. Experts predict that the investment needs in the water and sanitation sector could require $80–100 billion over the next decade and that concession models will play an important role in meeting these enormous needs (World Bank 1997b). A total of 10 concession water projects have accounted for $6,167 million with the project value averaging $219 million, excluding the Metropolitan Waterworks and Sewerage System in the Philippines. Table 4 presents a list of the 10 concession projects studied in the water sector.

By Developer

Globalization in the construction industry has been one of the major driving forces for the boom of infrastructure privatizations in particular concession models. With this global movement, local developers as well as foreign utility organizations, including major international contractors, design and engineering firms, heavy equipment suppliers, real estate developers, and global trading companies, were able to join as the key members of consortia for concession projects in Asia. This section analyzes the share of concession markets by the nationality of developers, i.e., the country from which the private concessionaires were originated.

Foreign firms from 17 different nationalities have participated in promoting Asian concession infrastructure projects. These 17 nationalities embrace Australia, Canada, Finland, France, Germany, Greece, Hong Kong, Japan, Korea, Malaysia, Norway, Taiwan, Saudi Arabia, Singapore, Switzerland, the United Kingdom, and the United States. Fig. 3 shows the distribution of 87 sampled projects in 12 Asian countries awarded by the nationalities of leading concessionaires.

The total value of the individual countries or country groups analyzed in Fig. 3 is based on the proportion of equity holdings by the developers without considering debt domain. For instance, if two firms with different nationalities hold the equity of the project, the total project cost (a combination of equity and debt) will be divided into two amounts in accordance with the equity proportion. Then, they will be added in each country's or country group's account. However, this analysis has limits in some projects that have unidentified an equity structure. In such cases, the computation was based on an even distribution among the concessionaire's groups.

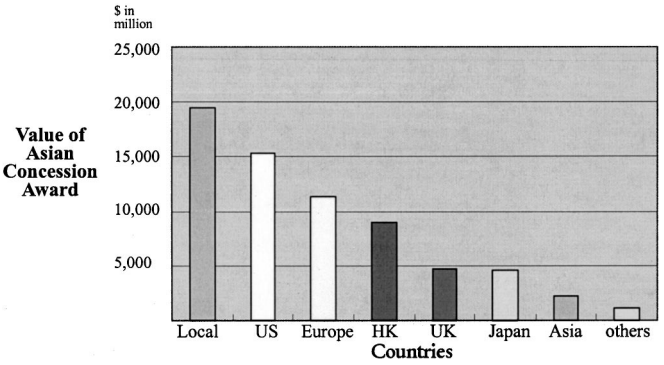

Fig. 3. Asian concession market distribution by developers

According to the analysis, approximately 29% or $19.5 billion of Asian concessions have been granted to local developers of the host countries. This emphasizes the vital role of local participation in infrastructure planning, construction, and operation. In particular, local participation in concession projects is an essential characteristic owing to the importance of: (1) local labor and work force management; (2) local construction and operational regulations (e.g., safety, quality, and environmental); (3) legal process requirements required by host countries or local municipalities (e.g., permits and licenses); (4) faster and on-time supply of domestic fuels, materials, and equipment; and (5) native culture.

Based on the analysis, international concessionaires have awarded 71% of total contract value. The total western private developers' participations, including American and European firms, have summed up to about 39%. The U.S. private developers have led with about a 22.6% market share. The European developers' share, including France, Germany, Finland, Norway, and Switzerland, was about 16.7%. Developers from the U.K. alone possessed about 7.0% of the total market.

The share of Hong Kong stationed companies were high, accounting for about 13.3%. Hong Kong based concessionaires have stepped into the transportation and power concession markets in China that aided creative thinking in the real estate business (Gibb 1988). Japanese and other Asian developers approximately accounted for 6.7 and 3.3%, respectively. In the late 1980s, Japanese general contractors that hold superior techniques and experiences in tunneling and road construction have won early build-operate-transfer (BOT) transportation projects in Australia, Thailand, and Hong Kong. In the 1990s, the developing role of concession projects has shifted from general contractors to Japanese trading companies that have competitive advantages in project financing, material and equipment supply, and concession negotiations. Other major Asian developers include firms from Australia, Malaysia, Singapore, Korea, and Taiwan.

Fig. 4 compares the concession value of market share by local firms versus international developers in three individual infrastructure sectors. It reveals that the local developers' participations were relatively high in the transportation sector (44%) as compared with the power sector (9%) and water sector (33%). This implies that international developers were more competitive in power and water plant development projects, which require advanced technological and managerial advantages, than in road transportation projects. U.S. firms exceeded 45% of the total international concession value in the Asian concession power sector. These U.S. firms have specialty in the electrical power business with accumulated knowledge, extensive experience, and advanced technology.

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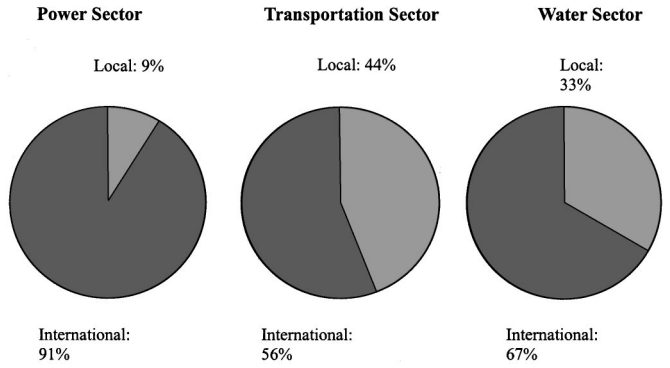

Fig. 4. Concession market comparison: local versus international

In the water sector, the combined share of European and U.S. developers was about 63%. In the transportation sector, international firms initially undertook the promotion of road projects with bridges and tunnels during the early years of concession development in the 1980s. However, their roles have converted to project developments that require relatively higher and more complex technology, such as high-speed trains, light rail transit (LRT), people-moving systems, and sky trains.

Finally, the total concession value of the leading concessionaires in each infrastructure sector and the number of projects were examined. Table 5 presents the top 10 in the power and the top five in the transportation and water sectors. A Hong Kong based developer was ranked in first place in both the power and transportation sectors. Also, the result that five U.S. power developers were included in the top 10 power concessionaires confirmed the strong participation of U.S. firms in power and transportation sector. Two Japanese trading companies have formed consortia with western developers and acted as partial equity contributors in all of their six power projects. This was to mitigate project risk associated with lack of their technological knowledge and managerial experience in power plant development. In the transportation sector, a Hong Kong stationed company that has exclusively invested in Chinese projects won the second position. A Malaysian company that had initiated four major domestic road projects was third in the transportation sector. In the water sector, a French water development company has participated in three projects, placing it at the top of the water sector.

Table 5. Top International Concessionaires in Asian Concession Market

Concessionaires	Value (US $ millions)	Number of projects
(a) Power sector		
Hopewell Holdings, Hong Kong	4,545	(6)
Congentrix, U.S.	2,800	(1)
Enron Group, U.S.	2,730	(3)
ABB Asea Brown Boveri, Swiss	2,442	(3)
Edison Mission, U.S.	1,900	(3)
Sithe Energy, U.S.	1,389	(5)
California Energy, U.S.	1,310	(2)
Siemens, Germany	1,230	(2)
Marubeni, Japan	1,139	(5)
Mitsui, Japan	813	(1)
(b) Transportation sector		
Hopewell Holdings, Hong Kong	5,900	(4)
New World Infrastructure	3,234	(4)
Renong and United Engineers, Malaysia	2,940	(4)
Kumagai-Gumi, Japan	1,998	(4)
SNC-Lavaline, Canada	1,800	(1)
(c) Water sector		
Suez Lyonnaise des Eaux, France	1,420	(3)
Ayala Corp., U.S.	1,190	(1)
Puncak Niaga, Malaysia	800	(1)
Bechtel, U.S.	340	(1)
Water Management, Inc., U.S.	125	(1)

Problem Analysis of Concession Projects

The concession model played a crucial role in responding to the enormous demand for infrastructure development in Asia. However, not all of these concession projects were successful. According to the analysis of 87 concession projects in Asia, 14 concession projects have faced one major problem or another. The project cost of these 14 identified concession projects reached $19,856 million, approximately 30% of the total concession value. Table 6 summarizes 14 concession projects with their contract values, leading concessionaires, present status, and leading problems.

The following subsections discuss the primary causes and outlook of 14 concession projects with various problems according to different countries.

Thailand

The Second Stage Expressway in Bangkok was taken over by its local contractor from its original concessionaire after a serious dispute among the concessionaire, the Thai Expressway, and the Rapid Transit Authority. The Bangkok Sky Train was declared null and void because the Thai government refused to provide loan guarantees and the Canadian concessionaire could not meet the deadline to sign shareholders' agreement. The Don Muang Tollway project ran into serious financial difficulties because of the Thai government's deferral of demolishing two existing flyer roads to improve the usage of the Don Muang toll road. The Bangkok Transit System (BTSC) project was behind schedule due to strong environmental opposition.

In the case of $3.2 billion Bangkok Elevated Rail/Road Transit System (BERTS), the concessionaire has made an express provision of $5 billion against the loss of its investment. The State Railways of Thailand (SRT) said that the concessionaire has failed to meet the construction deadlines within the schedule. The concessionaire has alleged that the government failed to hand over land holdings along the route. However, the SRT claimed that concessionaire has been unable to attract financial backing. The government has formally revised the concessionaire's original plan and resumed concession negotiation to take over the stalled project with several interested consortia.

India

The concessionaire of the Mangalore thermal power project was charged with environmental damages by the state government. The Dabhol power project was highlighted as a pure independent power facility without any multilateral support or degree of involvement of the state government. This displayed an effort by the Indian state government to distance itself from project risk and to provide more rights and responsibility to the private developer. However, the project resulted in a five-year delay due to disputes with local social activists.

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Table 6. Analysis of 14 Concession Projects with Various Problems

Name of project	Value (US $ millions)	Major concessionaires	Status	Problems
		(a) Thailand		
Second Stage Expressway	1,000	Kumagai Gumi	Expropriated	Legal
Bangkok Sky Train	1,800	SNC-Lavaline	Cancelled	Political
Elevated Rail/Road Project	3,200	Hopewell	Suspended	Financial
Don Muang Tollway	416	Dyckerhoff & Widman	In Operation	Economic
Bangkok Transit System	880	Tanayoung & Parsons	Delayed	Environmental
		(b) India		
Mangalore Power	2,800	Congentrix	Delayed	Environmental
Dabhol Power	2,500	Enron	Delayed	Social
		(c) Malaysia		
Putra LRT2	880	Renong	Delayed	Technical
Second Crossing Road	570	Renong	In Operation	Political
Pantai Expressway	240	Renong	Suspended	Managerial
		(d) Pakistan		
Hub Power	1,500	National Power & Xenol Ind.	In Operation	Political/legal
		(e) China		
Guangzhou-Zhuhai Highway	1,200	Hopewell	In Operation	Managerial
Shajio C Power	1,100	Hopewell	In Operation	Political
		(f) Indonesia		
Jati B Power	1,770	Hopewell	Suspended	Economic/physical

Malaysia

After the successful completion of the light rail transit first phase (LRT1) by a consortium of European contractors and developers, the light rail transit second phase (LRT2) project, called Putra, was halted several times due to inexperienced work-site management led by a group of local contractors consortium. The consortium has also been involved in a number of crane collapses, causing serious worker injuries.

The differences of determining the final toll rates of the Second Crossing Roads linking Malaysia and Singapore resulted in schedule delays and wasted resources from extended negotiations among the concessionaire and two countries. The Pantai Expressway project had to be stalled after 7% completion of construction, because the lenders rejected commercial paper issued by the project concessionaire.

Pakistan

The project sponsors had to spend more than 9 years of negotiation for the Hub power project in putting the financing package and related legal issues together, regardless of the strong commitments by the Pakistan Water and Power Development Authority (WAPDA). In 1998, a former director of the Hub project was detained by the Pakistan authorities owing to corrupt practices on the Hub power project.

China

The Guangzhou-Shenzhen Superhighway has bumped into serious cost overruns, resulting in financial problems and project sale by the developer. The Shajiao C power plant was paralyzed because of a sudden declaration of ordinance of a 12% rate of return ceiling on all BOT power plants by the Chinese government.

Indonesia

The financial and political crisis in Indonesia in the late 1997 has hurt the confidence of foreign developers, lenders, and investors in investing in future Indonesian infrastructure projects. The completed projects suffered from revenue shortages due to depreciated currency and diminished demand. The government postponed or cancelled plans to build 15 future power projects. The Tanjong Jati B project had to suspend its construction after 35% completion in 1998 as a result of the inferior domestic business environment.

Findings and Discussions

Five major problems are identified based on the analysis of data. First, the average value for 14 concession projects with major problems in Asia was approximately $1,418 million. This value is almost twice the total mean value of the 87 sampled projects of $778 million. Twenty-eight projects were less than $200 million out of the 87 projects; however, none of these small-sized concessions were included in problem projects. Based on the analysis, we could conclude that the risk of project failure increases as the size of the project increases.

Second, concession projects in two Asian HIE, Australia and Hong Kong, have been more successful in completing concession projects. The concession markets in these two nations have evolved in different ways. In Australia, most concession projects have been developed by home-based contractors and funded by home-based banks to reduce legal complexity and currency exchange rate risks. In Hong Kong, international contractors, developers, and bankers promoted most of the concession projects. This was possible because of Hong Kong's mature financial market, where international capital investors and lenders were able to

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transact money in simpler, faster, and clearer manners compared with MIE or LIME.

Third, the Philippines provided more satisfactory stories compared to other countries. The Philippines hold one of the longest histories and largest concession markets in Asia. Also, Australia, Hong Kong, and the Philippines are English-speaking nations. It seems that the cultural and social influences of the English language contribute to the success of concession projects where negotiations and documentation are done in English.

Fourth, a single concessionaire without a joint venture or consortium has sponsored 11 of the 14 disappointing projects. One of the major features of concession projects is the ability to reduce risk by involving organizations that manage risk effectively. The analysis supports that risks in concession infrastructure development project can be reduced and mitigated by forming joint ventures or consortiuam with experienced international participants.

Finally, the risks that have caused major problems to the international infrastructure development projects in each of the 14 projects can be categorized into nine risk areas: political, social, economic, financial, legal, managerial, technical, environmental, and physical risk. However, based on the small sample sizes it was difficult to find major risk factors that contribute to project problems.

Summary and Conclusion

The concession model in Asia has responded successfully to the high demand for infrastructure development in the power, transportation, and water sectors; however, approximately 30% of the total sampled concession value had serious problems, causing substantial financial losses to investors and resulting in cancellation, delay, and suspension of the project:

- In Asia, concession projects played a more important role in supplying essential infrastructure for developing countries than developed countries. Among the four country groups, the upper middle income economies (UMIE) and the lower middle income economies (LMIE) comprised the largest value of concession projects, followed by the low income economies (LIE);
- The experiences of concession projects in the water sector have been limited as compared with the power and transportation sectors. However, the water sector possesses a huge potential for further development in Asia; and
- The analysis has confirmed that local firms had an important and active role in concession projects. The analysis also showed that the western private companies from North America and Europe have been thriving in Asia, particularly in the power and water sectors.

Future research should focus on identifying major influential factors for long-term prosperity of the concession model in Asia.

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References

Chatterjee, S. (1996). *Recent experience in the private financing of infrastructure in Asia: an analysis of related issues*, Asian Development Bank.

Cho, H. C. (1999). ''Study on concession models for private sector involvement in asian infrastructure development.'' PhD dissertation, Univ. of Tokyo, Tokyo.

Gibb, R. (1988). ''Gordon Wu takes the road to China.'' *Eng. News Rec.*, 23.

Huang, Y. L. (1995). ''Project and policy analysis of build-operate-transfer infrastructure development.'' PhD dissertation, Univ. of California at Berkeley, Berkeley, Calif.

Lazonick, W. (1990). *Competitive advantage on the shop floor*, Harvard Univ., Cambridge, Mass.

Tiong, R. (1992). ''Strategies in risk management of on-demand guarantees.'' *J. Constr. Eng. Manage.*, 118(2), 229–243.

Tiong, R. (1995a). ''Competitive advantage of equity in a BOT tender.'' *J. Constr. Eng. Manage.*, 121(3), 282–289.

Tiong, R. (1995b). ''Impact of financial package versus technical solution in a BOT tender.'' *J. Constr. Eng. Manage.*, 121(3), 304–311.

Tiong, R., Yeo, K. T., and McCarthy, S. C. (1992). ''Critical success factors in winning BOT contracts.'' *J. Constr. Eng. Manage.*, 118(2), 217–228.

World Bank. (1994). *World development report 1994: infrastructure for development*, Oxford Univ., Oxford, U.K.

World Bank. (1997a). *World development report 1997: the state in a changing world*, Oxford Univ., Oxford, U.K.

World Bank. (1997b). *Discussion paper for finance and development: private capital in water and sanitation*, Washington, D.C.