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No.15

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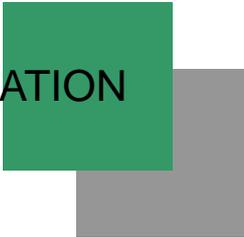
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JBIC Institute

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Exploring the Use of Revenue Bond for Infrastructure Financing in Asia*

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Abstract

Considerable attention has been paid to private participation in infrastructure (PPI) as an alternative approach for infrastructure development in order to minimize government fiscal burdens and to maximize efficiency gains through the use of private sector know-how. Growing financing gaps in infrastructure development, particularly in Asia, have called for an urgent resolution. However, PPI can make the best use of private funds to relieve fiscal burdens only with appropriate risk sharing between the public and private sectors.

Local bond markets should play an important role in supplementing infrastructure financing and for avoiding double-mismatch problems. Several cases of infrastructure financing with private participation in Japan, the United States, and some of the emerging economies suggest that the use of revenue bond with appropriate risk sharing and properly designed government support could help fill the gap without causing moral hazard problems. In this paper, we tentatively propose a few conceivable variations of revenue bond for infrastructure financing with private participation based on appropriate risk sharing concepts.

Keywords: infrastructure financing, moral hazard, private participation in infrastructure, public-private partnerships, revenue bond, risk sharing

JEL classification: G1, G18, H54, H63

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1 Introduction

Owing to budget constraints and fiscal burden of the government, considerable attention has been paid to the private sector as an alternative source of financing for infrastructure projects. Consequently, the concept of private participation in infrastructure (PPI) has been developed through methods such as privatization, private finance initiative (PFI), and public-private partnership (PPP)¹. In order to promote PPI, the government introduced policy supports, such as tax exemptions, minimum revenue guarantee, and other various measures to mitigate the risks inherent in infrastructure projects that typically entail a lengthy gestation period and large-scale financing.

Contrary to the original intention, however, some PPI cases in the emerging Asian economies did not relieve fiscal burdens because when the infrastructure projects failed, they were eventually rescued by government budgets based on the premise of social necessity. In some cases, such government support without appropriate risk sharing may cause moral hazard problems with the private parties involved in the project. For example, they may fail to provide private sector sponsors or operators sufficient incentives to design and monitor their projects carefully if the government shows its readiness, either explicitly or implicitly, to cover the loss of failed projects in any event. Commercial risks are best controlled and absorbed by the private parties involved in the project, while political and regulatory risks should be in the hands of the government.

With the Asian economy recovering after the financial crisis in 1997, the need for infrastructure development and financing in the region started to rise again. Nevertheless, vast financing gaps remain due to the immature long-term debt markets and limited private participation in the region.

¹ For the terminology, see Yescombe (2007).

Against this background, this paper aims to propose new schemes for infrastructure financing, which basically securitize cash flows generated by infrastructure projects, with an appropriate risk-sharing mechanism between the public and private players.

Following this introduction, Section 2 provides a brief overview of the current state of infrastructure financing in Asia and the need for local bond markets. Section 3 presents several cases of infrastructure financing with private participation with focus on some of the key features of infrastructure financing. Thereafter, in Sections 4 and 5, we tentatively propose a few conceivable variations of revenue bond for infrastructure financing with appropriate risk sharing between the public and private sectors, followed by a brief conclusion in Section 6.

2 Infrastructure Financing and Rationale for Local Bond Markets in Asia

2.1 Growing Financing Gaps in Infrastructure Development in Asia

In the 1990s, until the emergence of the Asian financial crisis, the prevailing optimistic views on Asia's high growth attracted local and international private investors to infrastructure development in the region. However, a sudden economic downturn after the crisis in 1997 resulted in the restructuring of some large-scale infrastructure projects, followed by a sharp decline in private investments in infrastructure (Table 1). Most private investments in the infrastructure sector were financed through medium- and long-term loans from domestic and foreign banks.

Table 1. Total Private Investment in Infrastructure Sector in Asia by Country²

	Cambodia	China	Indonesia	Laos	Malaysia	Myanmar	Philippines	Thailand	Vietnam
1990	0	173	116	0	870	0	98	692	0
1991	0	2,379	11	0	0	0	433	268	0
1992	13	2,414	252	0	1,794	0	814	1,902	0
1993	18	3,369	602	0	4,702	0	1,934	2,631	0
1994	0	3,165	1,954	0	6,730	0	2,218	664	10
1995	122	1,447	4,977	0	4,111	394	3,222	3,615	256
1996	8	8,093	7,488	628	4,191	50	3,260	3,749	220
1997	205	13,220	4,857	0	3,070	0	12,111	2,846	180
1998	14	4,969	1,541	1	766	0	1,807	933	39
1999	17	7,247	2,413	7	805	0	888	698	121
2000	28	8,131	642	5	5,519	0	2,153	1,377	150
2001	97	1,861	1,458	12	2,868	0	2,738	3,257	241
2002	40	5,464	1,509	20	506	0	863	1,198	1,800
2003	17	7,831	1,749	6	4,056	0	1,388	2,079	642
2004	86	3,707	1,607	34	5,261	0	1,551	1,052	70
2005	94	8,761	1,445	1,260	2,666	0	768	2,560	0
2006	250	8,287	4,622	810	1,230	0	1,815	1,149	260

Source: World Bank, *Private Participation in Infrastructure Database*

The recovery from the financial crisis and high economic growth has resulted in a great need for infrastructure development and financing in Asia. However, vast financing gaps remain due to the limited banking capabilities and immature institutional frameworks for securing private participation. A joint study by ADB, JBIC, and the World Bank reports that the financing needs in infrastructure development in East Asia amount to USD 228 billion per year for the period 2006–2010, but only USD 48 billion can be secured (Table 2). UNESCAP (2006) also shows that the Asia-Pacific region requires USD 608 billion per year, but there still remains a financing gap of USD 220 billion.

Table 2. Estimated Infrastructure Financing Needs

	Infrastructure Needs (US\$ billion)	Financing Gap (US\$ billion)
ADB, JBIC, and World Bank	228	180
UNESCAP	608	220

Source: UNESCAP (2006)

² The data covers contractual arrangements with and without investments in which private parties assume operating risks. The sectors covered are energy, telecommunications, transport, and water. For further details, see World Bank's *Private Participation in Infrastructure Database*.

Table 3 presents the composition of the financing sources for infrastructure projects: bank loans (foreign 58.8%, domestic 21.6%), equity (foreign 10.1%, domestic 1.7%), and bonds (foreign 4.0%, domestic 3.9%). There are two mismatches in infrastructure financing that are clearly observed from Table 3. One is a term mismatch because 80% of the infrastructure projects are financed with bank loans, which are mostly converted from short-term deposits and only provide a maximum term of five to seven years. The other is a currency mismatch because project revenues are generated in local currencies while the major sources of financing are of foreign origin, most likely being provided in foreign currencies (72.9%).

Table 3. Private Sector Infrastructure Financing by Instrument

(US\$ million; percentage of the total)

	Bond Foreign	Bond Domestic	Loan Foreign	Loan Domestic	Equity Foreign	Equity Domestic	Total
Cambodia	0	0	1 (100.0)	0	0	0	1
China	1,812 (5.0)	604 (1.7)	24,494 (67.3)	5,337 (14.7)	4,172 (11.5)	0	36,419
Hong Kong	92 (0.3)	39 (0.1)	14,885 (55.1)	8,758 (32.4)	2,790 (10.3)	458 (1.7)	27,022
Indonesia	1,280 (4.5)	0	20,985 (74.5)	2,524 (9.0)	3,314 (11.8)	70 (0.2)	28,173
Malaysia	529 (2.5)	4,784 (22.6)	3,229 (15.3)	10,396 (49.1)	1,147 (5.4)	1,077 (5.1)	21,162
Myanmar	0	0	30 (100.0)	0	0	0	30
Philippines	2,028 (14.1)	0	10,662 (73.9)	35 (0.2)	1,698 (11.8)	0	14,421
Singapore	0	0	2,027 (66.7)	924 (30.4)	0	87 (2.9)	3,039
Thailand	180 (1.2)	295 (2.0)	7,913 (54.7)	3,865 (26.7)	1,454 (10.0)	767 (5.3)	14,474
Vietnam	0	0	2,348 (89.9)	18 (0.7)	246 (9.4)	0	2,612
Total	5,920 (4.0)	5,721 (3.9)	86,573 (58.8)	31,856 (21.6)	14,822 (10.1)	2,459 (1.7)	147,351

Source: Based on Kotecha and Sharon (2004); recalculated by the author

Figures in parenthesis denote for the percentage of total financing.

2.2 Bank Loans versus Bonds³

A bank loan is transacted via a direct relationship between a lender and a borrower and can be characterized as a negotiable form of financing with flexible disbursement and a possible rescheduling of repayment. Clause amendments and waivers of the loan agreement enable the related parties to negotiate the terms and conditions of the loan. Banks assess the creditworthiness of prospective borrowers (or projects) and sort out safe borrowers from the less safe ones. After loans are made, banks monitor the borrower's business and projects to prevent moral hazards and negligence. Information gathering and monitoring take place on a bilateral basis between the borrower and lender.

On the other hand, bond financing is characterized as a direct tool via financial markets comprising a broad range of investors. In order to issue bonds, a firm's financial conditions are rated and the information gathered in the process of rating is shared with potential investors. Bonds constitute a standardized financial vehicle and, most importantly, a transferable financing instrument through the markets. Because of these characteristics, however, bonds are normally not as flexible as bank loans in terms of suitability of size, timeliness⁴, and negotiability and consequently involve additional transaction costs.

Despite the disadvantages of bonds as compared to bank loans, given the nature of infrastructure projects, local bond markets could play an important role in mobilizing

³ The standard literature on project finance provides detailed explanations of the advantages and disadvantages of the use of bond markets as compared to bank loans. For example, see Hoffman (1998) and Yescombe (2002, 2007).

⁴ Medium term note (MTN) program may potentially be utilized for financing long-term infrastructure projects by issuing bonds based on issuer's financing needs within the fixed amount programmed. Incidentally, a study exploring the promotion of the Asian MTN Program was proposed at the 10th ASEAN+3 Finance Ministers' Meeting held in Kyoto in May 2007, as stated in ASEAN+3 (2007).

supplementary funds for large-scale projects and in minimizing double mismatch problems. Large financing gaps and advantages of bond financing for long-term infrastructure projects constitute an impetus for the development of long-term, local currency-denominated bond markets, and therefore the rationale for the Asian Bond Markets Initiative (ABMI)⁵.

3 Cases of Infrastructure Financing with Private Participation

3.1 Revenue Bonds Used by Municipalities in the United States

A model of bond structure suitable for infrastructure financing is the revenue bond used extensively by municipalities in the United States. Municipal bonds or securities in the United States are defined as “... securities issued by local governmental subdivisions such as cities, towns, villages, counties or special districts, as well as securities issued by states and political subdivisions or agencies of states. A prime feature of these securities is that interest or other investment earnings on them usually are excluded from gross income of the holder for federal income tax purposes. Issuers of municipal securities are exempt from most federal securities laws.”⁶ In the United States, municipal bonds are used to finance a wide range of public projects such as ports, airports, highways, sewages, hospitals, and colleges.

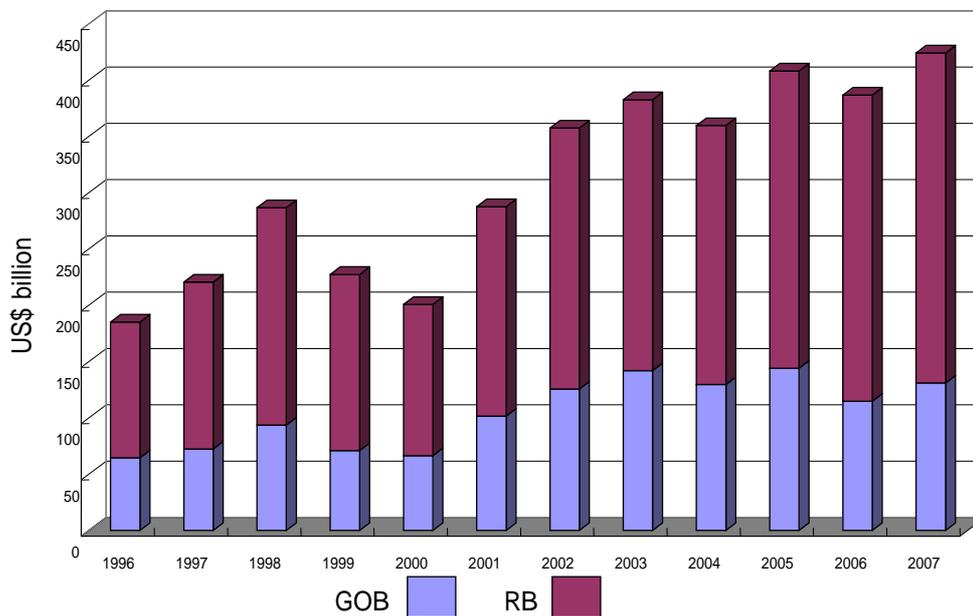
There are two types of municipal bonds depending on the source of debt service. Revenue bonds (RBs) are a type of municipal bonds, whose debt service is normally payable from identified sources of revenue generated from the financed project. On the

⁵ For further development of Asian bond markets, a study exploring new debt instruments for infrastructure financing was proposed at the 10th ASEAN+3 Finance Ministers’ Meeting held in Kyoto in May 2007, as stated in ASEAN+3 (2007). For details on the progress in ABMI, see Hyun (2007).

⁶ See MSRB (2004).

other hand, general obligation bonds (GOBs) are a type of municipal bonds, whose debt service is payable from general revenues of the issuer of such municipal bonds. In other words, the full faith and credit of an issuer with taxing power is pledged to GOBs, but not to RBs. Long-term municipal bonds⁷ issued in 2007 amounted to USD 424.3 billion, out of which USD 293.2, equivalent to 69.1% of the total, were RBs (Figure 1).

Figure 1. Municipal Bond Issuance



Source: SIFMA

Procedures and regulations applied to RBs and GOBs are inherently different due to their respective characteristics. RBs are neither subject to the issuance cap of a municipality nor require approval of the voters prior to issuance. On the other hand, GOBs often require approval by election prior to issuance.

RBs generally offer a higher coupon rate than GOBs. Investors take some risks in exchange for the higher return. On a dollar volume basis, 83.8% of GOBs and 70.6% of

⁷ They are defined as municipal securities with a maturity period of 13 months or longer at the time of issuance.

RBs issued during the first half of 2007 were rated Aa or above by Moody's. Third-party credit enhancement, for example, by monoline insurers, is used in some cases to provide additional security to a bond.

3.2 Social Overhead Capital Bond Financing in Korea

In order to facilitate PPI in Korea, the Promotion of Private Capital into Social Overhead Investment Act (PPI Act) was passed and enforced for the first time in 1994. The PPI Act and the Enforcement Decree, as the principal components of the legal framework for PPPs, define the “eligible facility types, implementation schemes and process, conflict resolution/termination mechanism, and the roles of the public and private parties.”⁸ The Act was amended in 1999 to introduce risk sharing and minimum revenue guarantee (MRG) mechanism and again in 2005 to introduce the Build-Transfer-Lease (BTL) scheme, diversification of facility types, and expansion of investor profile.

The government supported PPI projects through various policy measures⁹. Construction subsidies can be granted to the concessionaire if the subsidies are unavoidable for maintaining the user fees of the services provided at an appropriate level. A certain fraction of projected revenue can be guaranteed through the MRG agreement if the actual operating revenue falls short of the projected level. Moreover, various preferential tax treatments are applied to PPI projects. Furthermore, Korea Infrastructure Credit Guarantee Fund (KICGF)¹⁰, which was established in 1994, provides credit guarantee services, including guarantee for infrastructure bond.

Among these government supports, the MRG mechanism resulted in an increasing

⁸ For details, see MPB (2006).

⁹ For the details, see MPB (2006).

¹⁰ For the details, see KODIT (2006).

fiscal burden because the actual revenue fell far short of the projected revenue (See Table 4). Against this background, since the revision of the PPI system in 2006, the government has become more selective about providing MRG¹¹. While MRG continues to be reduced, the government expects an increasing demand for infrastructure credit guarantee.

Table 4. MRG Subsidies

(Unit: %, KRW billion)

	Traffic Volume		MRG Subsidy	
	Year	Actual Volume	Year	Amount
Incheon International Airport Expressway	2005	52.8%	2001-2005	481.7
Cheonan-Nonsan Expressway	2004	52.2%	2003-2005	118.0
Gwangju 2nd Beltway, Section 1	2004	62.2%	2001-2004	24.7
Woomyunsan Tunnel	2004	26.8%	2004	10.6

Source: Korea Fixed Income Research Institute

Korean Social Overhead Capital (SOC) bonds are broadly classified into two groups depending on whether the bond is issued based on the PPI Act or not; for the sake of simplicity, we refer to the former as the “PPI bond” and the latter as the “non-PPI bond.” The PPI bond is defined and regulated by the PPI Act and is granted special tax treatment. The non-PPI bonds were issued to finance the construction and/or operation and maintenance (O&M) costs and to refinance the project expense after the construction completion.

There have been six cases of SOC bond issuance in Korea since the first one for financing the combined heat and power plants at the Incheon International Airport in 1999. Because of the special tax treatment and the difficulty in obtaining syndicated

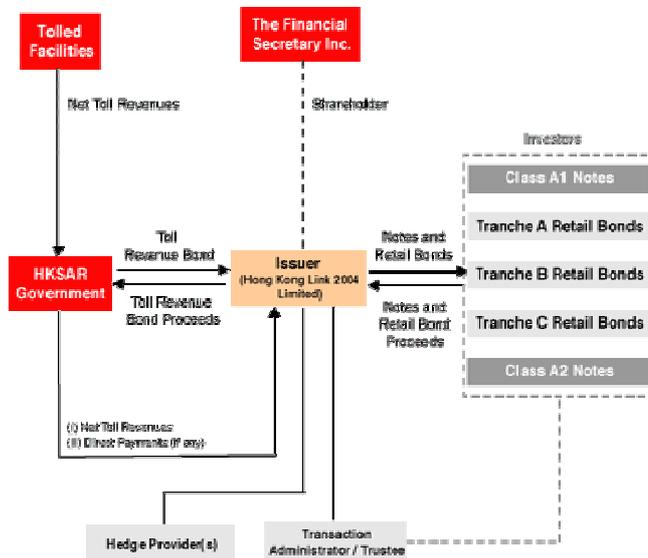
¹¹ MRG to unsolicited projects proposed by the private sector has been eliminated and the period and amount of MRG for solicited projects have been substantially reduced.

bank loans in the aftermath of the 1997 financial crisis, SOC bonds were a popular type of instrument for infrastructure financing. However, in recent years, a relatively low expected rate of return and high transaction costs involved in SOC bonds made them a less attractive option for infrastructure financing; whereas investors are competing for higher returns provided by alternative financial products as reflected in the recent performance of private sector infrastructure funds in Korea¹².

3.3 Hong Kong Link 2004 Limited

In order to reduce fiscal burdens, in April 1999, the government of Hong Kong Special Administrative Region (HKSAR) raised HKD 6.0 billion by securitizing revenues from the existing tolled infrastructure facilities consisting of the five tunnels and one bridge/road link. The transaction structure is set out in Figure 2.

Figure 2. Transaction Structure of Hong Kong Link 2004 Limited

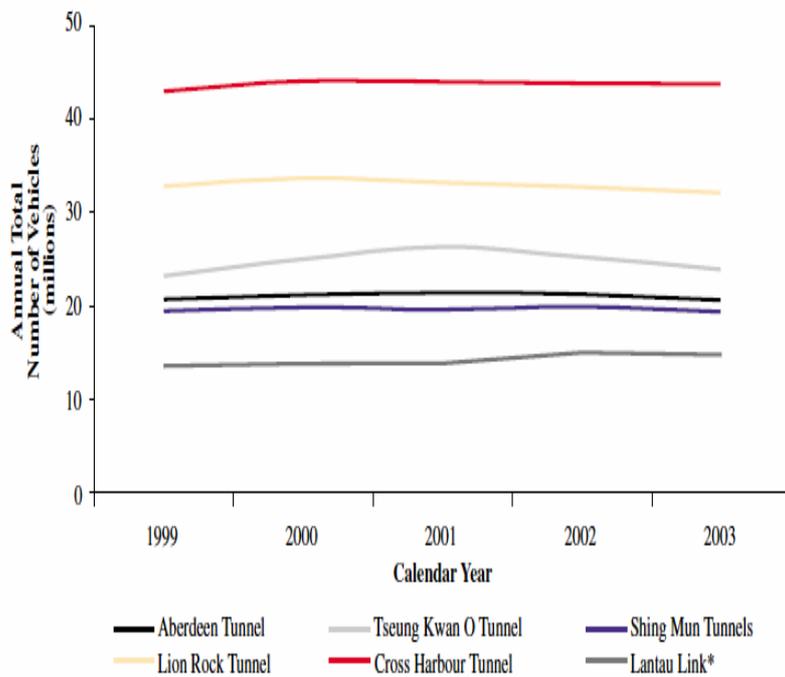


Source: Hong Kong Link 2004 Limited

¹² For example, Macquarie Korea Infrastructure Fund (MKIF) established in December 2002 has eventually become “one of the private sector infrastructure funds in Korea with the largest portfolio of infrastructure assets in Korea that have been, or are being, constructed under the Private Participation in Infrastructure Act” (MKIF Company Profile).

For the purposes of this transaction, a single-purpose limited liability company named Hong Kong Link 2004 Limited (HK Link) was established with its share capital wholly owned by HKSAR. HK Link issued retail notes and bonds (Retail Notes & Bonds) to institutional and individual investors, respectively. The gross proceeds of Retail Bonds & Notes issued were used by HK Link to subscribe for the toll revenue bond (TRB) issued by HKSAR. Debt service payments on Retail Notes & Bonds are ultimately backed by the net toll revenues from the tolled facilities through HK Link's subscription of TRB, supplemented by direct payments from HKSAR to mitigate risks under certain pre-specified circumstances.

Figure 3. Stable Traffic Volume through Tolled Facilities



Source: Hong Kong Link 2004 Limited

The successful factors of this securitization scheme include the robustness of cash flows

generated by the operationally matured tolled facilities (Figure 3) and strong government support in the form of direct payments to mitigate certain pre-specified risks, as reflected in the favorable rating assigned by rating agencies¹³. With this financial scheme, the government did not sell infrastructure assets to HK Link, which was a special purpose vehicle.

3.4 Bydgoszcz Water Revenue Bond in Poland

The Polish legislature made amendments to the Polish Law on Bonds in 2001 to allow certain entities to issue revenue bonds to facilitate financing of public services. It was expected that the introduction of an innovative financing instrument would enable a new class of investors, such as pension funds, to finance infrastructure for the first time in Poland.

Polish revenue bonds are characterized by the following two features. First, only a limited number of issuers, such as towns, cities, local self-governed entities, and firms that are partly owned by these entities, may issue revenue bonds only to satisfy the needs of the local society or to perform activities in the field of public utilities. Second, the obligee holds the preferential right as regards the satisfaction of their claims from the issuer's revenues and assets.

In 2005, Miejskie Wodociągi i Kanalizacja w Bydgoszczy Sp. Z.o.o. (MWiK), a water company owned by and servicing Poland's eighth-largest city Bydgoszcz, issued the first revenue bond in Poland to finance its investment program for the improvement of the water and sewage system in Bydgoszcz. The issue was a total of EUR 100 million with various tranches and priced based on the 6-month WIBOR, rated BBB- by Fitch. Of the total revenue bonds, 40% of the issue was purchased by European Bank for

¹³ For example, Fitch assigned AA+. For the details, see Fitch Ratings (2004).

Reconstruction and Development (EBRD) and 60% by the local pension funds and other institutional investors.

The total project cost was EUR 222 million, of which EUR 100 million was provided by a grant from the EU, another EUR 100 million by the revenue bonds, and the rest by BWC (Bydgoszcz Water Company) from internally generated cash flow. The bonds have a strong security package as envisaged by Polish Law on Bonds. MWiK, the city of Bydgoszcz, and the administrator (Bank Polska Kasa Opieki S.A.) have entered into a support agreement. They do not guarantee any repayment of obligations resulting from issued bonds, but support the issuer (MWiK) in obtaining sufficient revenues to ensure the correctness and timeliness of debt service and funds for the issuer's operations. It is also agreed that no new individual permits for the construction of deep-water wells and sewage disposal should be issued and that such permits should not be extended by the city of Bydgoszcz.

In this program, the EBRD tried to play a role as an anchor investor, who can help build confidence in revenue bonds in a new market. Until then, even though there were potential institutional investors such as pension funds, there had been no investment-grade local instruments to invest in infrastructure.

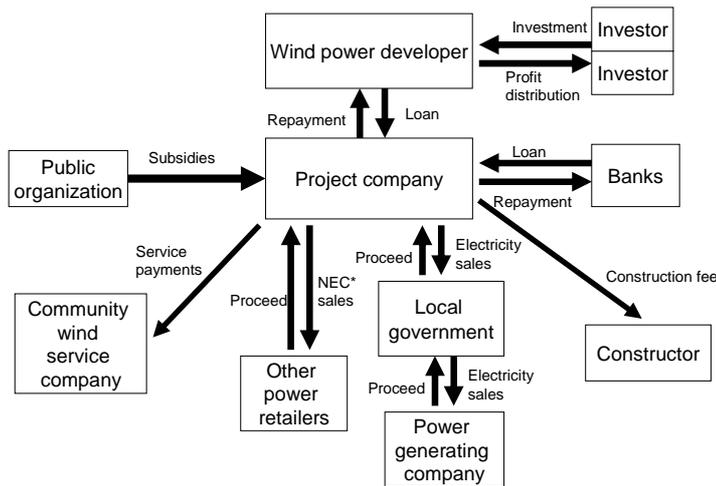
3.5 *Tokumei Kumiai* Scheme: The case of Japanese wind power

Although this scheme does not involve any bond financing, it has implications for financing community-based infrastructure projects with appropriate risk sharing between the public and private parties. In this particular case, *Tokumei Kumiai*, a type of partnership structure in Japan¹⁴, is used to mobilize private funds to finance a wind

¹⁴ A *Tokumei Kumiai* resembles a limited partnership formed under US law. The formation, construction, and the rights and obligations of the parties of a *Tokumei Kumiai* are provided in Articles 535 to 542 of the Commercial Code of Japan. A *Tokumei Kumiai* is formed by *Tokumei Kumiai* agreements entered into between the General Partner (*Eigyō-sha*) and each Limited Partner

power project, which at the same time receives subsidies provided by a government agency to develop renewable energy technologies.

Figure 4. *Tokumei Kumiai* Scheme: The case of the Japanese wind power



* NEC stands for "New Energy Certificates", which can be obtained by generating renewable energy and traded between electricity retailers and renewable energy generators. Under Japanese RPS (Renewable Portfolio Standard) System, electricity retailers are imposed an obligation to use a certain amount of electricity from new energy, and such obligation can be met by generating the new energy electricity, purchasing the new energy electricity from another party, and/or purchasing NEC from another party.

Sources: Prepared by the author based on the information from Natural Energy Civil Fund (Shizen Enerugi Simin Fando); and Agency for Natural Resources and Energy

As of June 2007, there have been ten cases of such community-based wind power projects operating in Japan with private sector funding partly coming from *Tokumei Kumiai*. With this arrangement, a wind power developer serves as a General Partner (*Eigyō-sha*) and recruits investors (Limited Partners, or *Tokumei Kumiai-in*) that make equity investments based on *Tokumei Kumiai* agreement. In the recent cases, equity contributions are multiples of a minimum transaction value ranging from JPY 100,000

(*Tokumei Kumiai-in*). Each Limited Partner invests a certain amount with the General Partner for the business operated by a *Tokumei Kumiai*. A *Tokumei Kumiai* is managed by the General Partner, and each Limited Partner has a right to inspect the management and the financial/asset condition of the *Tokumei Kumiai*. Under the *Tokumei Kumiai* investment structure, income and/or losses from the business operated by the *Tokumei Kumiai* are allocated to each Limited Partner unless otherwise agreed upon in the relevant agreement. In general, the liability of each Limited Partner to third parties is limited to the amount of investment made by them in the *Tokumei Kumiai*, whereas the General Partner's liability to third parties is unlimited.

(about USD 1,000) to JPY 500,000 (USD 5,000). Subsequently, a *Tokumei Kumiai* makes loans to a project company for the construction of a wind power plant. A project company sells electricity to a power generating company through the local government and uses the revenue to repay its debt to the *Tokumei Kumiai*. In the most recent case under preparation, 45% of the total project cost was expected to be financed by the subsidies, and the rest was to be financed mostly by private individual investors without any direct credit enhancement provided by the public sector.

The key to the success of this scheme is a one-off public fund injection into the project at the initial stage, which makes the project commercially viable and attractive to the investors. Further, the existence of local individual investors who can afford such an investment is crucial to the success of the scheme. Another benefit is that individual investors in a rather small community are most likely motivated to monitor the performance of the community-based project.

4 Conceivable Variations of Revenue Bond for Infrastructure Financing

4.1 Prerequisites for Effective Private Participation in Infrastructure

Private participation and the role of the government should be reviewed from two perspectives: the commercial viability and the social essentiality of a project. Government finance was traditionally regarded as a major source of infrastructure financing from the perspective of social essentiality. However, private finance has been popularized as a vital alternative source for financing infrastructure projects with commercial viability.

Given the risks of long-term and large-scale financing as well as other risks inherent in infrastructure projects, the private sector alone cannot finance infrastructure projects. For this reason, appropriate risk sharing between the public and private parties is required to effectively utilize both the knowledge and funds available in the private

sector.

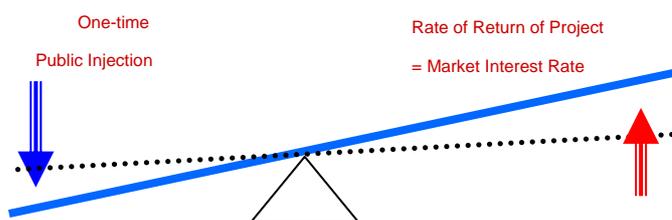
4.2 Revenue Bond with Viability Gap Funding

As described in Section 3, there exist various cases of infrastructure financing with private participation. However, it appears difficult for most emerging Asian economies to follow a model of bond financing similar to those shown in Section 3, because of the lack of a well-established institutional setting. Against this background, referring to the Japanese wind power case as described in Section 2, Yoshino (2007) proposes an internal mechanism to increase the commercial viability of a project through a one-off injection of the fixed amount of public funds. This concept is basically a one-off subsidy and is similar to that of viability gap funding¹⁵ being discussed in the context of PPPs. For this reason, we may refer to a type of bond issued for the purpose of infrastructure development in parallel with viability gap funding as “Public-Private Participation Bond” or “PPP Bond.”

With infrastructure projects that are socially essential but commercially less viable, the injection of public funds may be employed so as to raise the expected rate of return from the financed project to a level comparable with that of market interest rates. The important feature of the proposed internal mechanism to increase commercial viability is “done only once, not repeated” in order to not create moral hazards on the part of private sector players such as a sponsor of the project. Without this one-off feature, the existence of time-inconsistent preferences or tendencies can prevent the effective and careful designing, monitoring, and implementation of the project.

¹⁵ The World Bank (2006) states that “GoI (Government of India) acknowledges that the needed infrastructure investments for India may not be possible out of the budgetary resources of Government of India alone. In order to remove these shortcomings and to bring in private sector resources as well as techno-managerial efficiencies, the Government has committed to promoting Public Private Partnerships (PPPs) in infrastructure development. That said, it is also recognized that infrastructure projects have a long gestation period and may not all be fully financially viable on their own. On the other hand, financial viability can often be ensured through a mechanism that provides government support to reduce project costs. The GoI has therefore proposed to set up a special facility to provide such support to PPP projects. This support is generically termed as ‘viability gap funding’ and this facility will be housed in the DEA (Department of Economic Affairs). Suitable budgetary provisions will be made on a year-to-year basis. In the last couple of years, the central government has made available budgetary resources towards viability-gap funding. However, to date no amount has been drawn down.”

Figure 5. “Leverage” Provided by Injecting Public Funds



For particular types of infrastructure projects in developing countries, additional revenues generated by the sale of the so-called carbon credits, or “certified emission reductions,” under the Clean Development Mechanism (CDM)¹⁶ may help increase the expected rate of return from the financed project although there are risks inherent in CDM projects.

4.3 Performance-linked Coupon Bond

In order to utilize private funds and to make government finance in infrastructure more efficient, in parallel with a one-off injection of the fixed amount of public funds to raise commercial viability, Yoshino (2007) proposes the concept of a performance-linked coupon bond¹⁷. While principal and interest payments are secured by the securitized future cash flows from the financed project, the level of coupon payments varies according to the performance of the financed project¹⁸. This performance-linked variable coupon mechanism, with its unique characteristics similar to that of equity in part, provides investors with incentives to closely monitor the project performance, which in turn determines the level of interest earnings for the investors¹⁹.

To introduce such mechanism, the additional interest payments should be tied to a set of variables that represent the performance of the project. However, such a contingent interest arrangement of linking the performance of a project with the variable

¹⁶ See Appendix.

¹⁷ Yoshino (2007) does not use this particular term.

¹⁸ Yoshino (2004) points out that the major reason for the inefficiency of government finance in Japan is that government finance is often not implemented effectively and is offered at a fixed interest rate that does not reflect the productivity of the use of funds.

¹⁹ Incidentally, Daiwa Securities SMBC designed a euro dollar denominated CO2L Bond, whose coupon payments are linked to the price of certified emission reductions. This product has a feature similar to the concept of Yoshino’s performance-linked coupon bond. For the details, see Daiwa Securities SMBC (2007).

coupon rate should be carefully designed so as to not undermine the motivating factors, such as the maximum potential returns, for investors to provide equity capital. Perhaps, a maximum rate needs to be specified to establish a ceiling on the performance-linked variable coupon rate. Moreover, the feasibility of the performance-linked coupon bond, which can be seen as a type of sub-debt or mezzanine finance instrument, needs to be examined in light of the limited usage of sub-debt or mezzanine finance instruments in infrastructure financing.

5 Project Time Horizon and Bond Financing

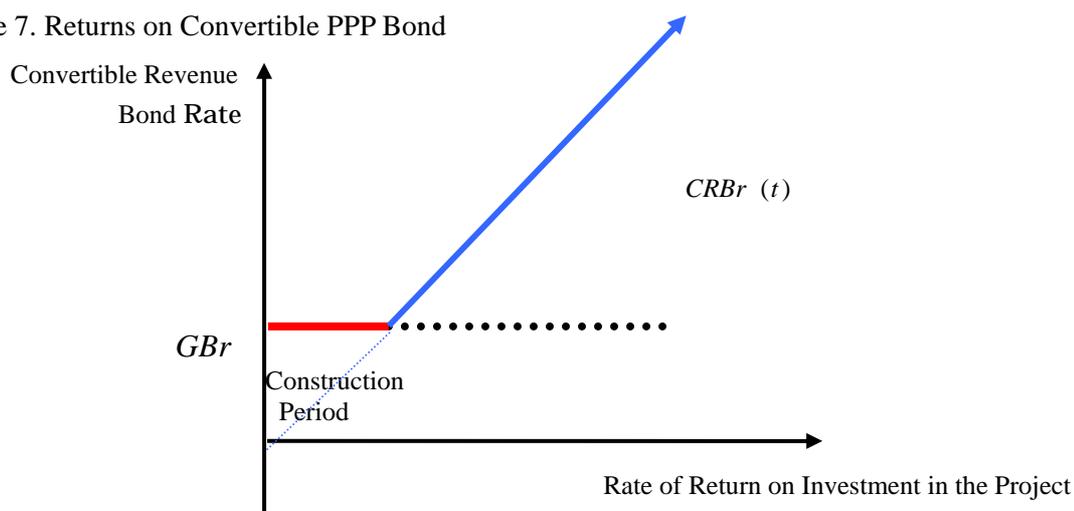
5.1 Securitization of Revenues from Matured Infrastructure Projects

From the perspective of the time horizon in infrastructure projects, during the initial period of three to five years from the start of construction, there normally exist high risks such as delays in construction, completion failure, and cost over-run. Taking into account such a time horizon of infrastructure projects, the government can bear the cost at the initial high-risk stage for building infrastructure. Rather than providing guarantee for the entire life of a project, the government can securitize cash flows generated by the operationally matured infrastructure facilities to secure private financing at a later stage. This enables the government to refinance the project cost after the construction completion and to mobilize funds for O&M.

5.2 Conversion of Government Bond to Performance-Linked Coupon Bond

An apparatus for appropriate public-private risk sharing and market discipline can be conceived by introducing a government bond (or a government-guaranteed bond; the two terms will be used interchangeably hereinafter) embedded with the fixed coupon rate (or the pre-determined variable coupon rate) and a call option so as to convert it into a performance-linked coupon bond. The conversion provision in the bond scheme grants bondholders the right to convert a government bond into a performance-linked coupon bond after the construction period. The bondholders decide whether to exercise their call option by closely monitoring the cash flows and the performance of the project.

Figure 7. Returns on Convertible PPP Bond



$$CRBr(t) = \text{Max}(GBr, PRR(t))$$

if $GBr > PRR(t)$ then $CRBr(t) = GBr$
 if $GBr < PRR(t)$ then $CRBr(t) = PRR(t)$

Note: GBr denotes the fixed interest rate of the government bond.
 $CRBr(t)$ denotes the variable interest rate of the convertible revenue bond.
 $PRR(t)$ denotes the rate of return from the project.

For example, as long as the perceived rate of return on a particular project remains below the fixed coupon rate of the government bond, the bondholders do not exercise their call option to convert the government bond into a performance-linked coupon bond. In that case, the government needs to pay the bondholders GBr and bear the burden $GBr - PRR(t)$. This mechanism provides the government with an incentive to carefully select and finance a project in light of both social essentiality and commercial viability. If the bondholders expect higher project returns, they convert the government bond into a performance-linked coupon bond and possibly obtain higher returns from the project.

A conversion ratio, a term that is different from the one normally used for referring to the number of common shares into which a convertible security may be converted, is aptly defined as the number of revenue bonds into which a government bonds may be converted. This ratio therefore indicates the performance of the project, implying that the ratio will increase if the bondholders expect the revenues from the project to be sufficiently high. Conversely, the ratio will be low or zero if the revenues are expected

to be lower than the fixed coupon or pre-determined variable coupon rate of the government bond. With this ratio, investors can monitor and evaluate the performance of the project.

6 Conclusion

Considerable attention has been paid to private participation in infrastructure (PPI) as an alternative approach for infrastructure development to minimize the government's fiscal burdens and to maximize efficiency gains through the use of private sector know-how. Growing financing gaps in infrastructure development, particularly in Asia, have necessitated an urgent resolution of this problem. However, PPI can make the best use of private funds to relieve fiscal burdens only with appropriate risk sharing between the public and private sectors.

Local bond markets should play an important role to supplement infrastructure financing and to avoid double mismatch problems. Several cases of infrastructure financing with private participation in Japan, the United States, and some of the emerging economies suggest that the use of revenue bond with appropriate risk sharing and properly-designed government support could help fill the gap without causing moral hazard problems. We tentatively propose a few conceivable variations of revenue bond for infrastructure financing with private participation based on appropriate risk sharing concepts.

Appendix

The CDM is one of the Kyoto Mechanisms under the Kyoto Protocol, which allows industrialized nations to undertake projects jointly with developing countries so that industrialized nations may use greenhouse gas (GHG) emission reductions (carbon credits) generated from such projects in order to meet their own emission reduction targets under the Kyoto Protocol.

Infrastructure projects such as photovoltaic power and rice husk power plants could potentially employ additional cash flow streams obtained from the CDM under the Kyoto Protocol. Such infrastructure projects with the CDM component can have two revenue sources—one from the sale of services produced and the other from the sale of certified emission reductions (CERs).

In addition to the risks traditionally involved in infrastructure projects, there are risks inherent in CDM projects, such as the additionality assessment risk, the volatility risk of CER prices, and uncertainty with regard to the Post-Kyoto Protocol.

References

- ADB, JBIC, and the World Bank (2005), *Connecting East Asia: A New Framework for Infrastructure*
- Daiwa Securities SMBC Co. Ltd. (Daiwa Securities SMBC) (2007), News Release, February 16, 2007 (in Japanese)
- Fitch Ratings (2004), Hong Kong Link 2004 Limited
- Hoffman, Scott (1998), *The Law and Business of International Project Finance*, Klumer Law International
- Hong Kong Link 2004 Limited (2004), Prospectus
- Hyun, Suk (2007), “Overview of Chiang Mai Initiative (CMI) and Asian Bond Markets Initiative (ABMI),” Chapter 2 in *Proposal for the Establishment of Asian Bond Market*, LexisNexis Press (in Japanese)
- Japan Research Institute (2007), *Asia Monthly*, No 73, Vol 07 (in Japanese)
- Joint Ministerial Statement of the 10th ASEAN+3 Finance Ministers’ Meeting (ASEAN+3) (2007)
- Korea Credit Guarantee Fund (KODIT) (2006), *Infrastructure Facility Construction with Korea Infrastructure Credit Guarantee Fund*
- Kotecha, Mahesh and S. Ryan Sharon (2004), “Role of the Financial Sector: Channeling Private Savings to Infrastructure Investment in East Asia and the Pacific (EAP),” ADB-JBIC-World Bank East Asia and Pacific Infrastructure Flagship Study
- Ministry of Economy, Trade and Industry (METI) (2006), *Asia Public Private Partnership Studies* (in Japanese)
- Ministry of Planning and Budget, Republic of Korea (MPB) (2006), *Korean PPI System*
- Municipal Securities Rulemaking Board (MSRB) (2004), *Glossary of Municipal Securities Terms*, Second Edition
- Securities Industry and Financial Markets Association (SIFMA) (2008), *Municipal Bond Credit Report*, April 2008
- Taki, Toshio (2007), “Funds Change What Infrastructure Privatization Should Be,” Nomura Financial Market Research Institute (in Japanese)
- UNESCAP (2006), “Enhancing Regional Cooperation in Financing Infrastructure Investment,” Chapter VIII *Enhancing Regional Cooperation in Infrastructure Development Including That Related To Disaster Management*, the 62nd Commission Theme Study
- World Bank (2006), *India—Financing Infrastructure: Addressing Constraints and Challenges*

- Yescombe, Edward (2002), *Principles of Project Finance*, Academic Press
- Yescombe, Edward (2007), *Public-Private Partnerships—Principles of Policy and Finance*, Butterworth-Heinemann
- Yoshino, Naoyuki and Frank Robaschik (2004a), “Local Government Finance in Japan: Can Irresponsible Borrowing Be Avoided?” Duisburg Working Papers on East Asian Economic Studies, No. 72/2004
- Yoshino, Naoyuki and Frank Robaschik (2004b), “Revenue Bond and the Establishment of Disciplinary Fiscal Policy,” *Financial Review*, MOF Japan Vol 74 (in Japanese)
- Yoshino, Naoyuki (2006), “Use of Private Fund to Make Disciplinary Infrastructure Investment—Revenue Bond,” Chapter 4 in *Policy Making in the Era of Low Birth Population*, Public Finance Research, Japan Public Finance Association, Vol 2 (in Japanese)
- Yoshino, Naoyuki (2007), “On Securitization of SME Financing, Revenue Bonds and Infrastructure Development,” presented at the Ninth Session of Sub-council on Foreign Exchange and Other Transactions, Council on Customs, Tariff, Foreign Exchange and Other Transactions (in Japanese)
- Yoshino, Naoyuki (2008), “Using Private-Sector Funding to Establish Fiscal Discipline: The Way to Improve Fiscal Policy Discipline by Introducing Revenue Bonds” in *The Japanese Economy: A Market Quality Perspective*, Keio University, Economic/Business-Commerce 21 COE Program
- Yoshino, Naoyuki, Satoshi Nakagawa and Suk Hyun (2007), “Development of Infrastructure Bond Market in Asia: Feasibility of Asian Infrastructure Bond Fund,” Keio University COE Project Discussion Paper Series DP2007-001

Websites:

European Bank for Reconstruction and Development (EBRD), <http://www.ebrd.com>

Hong Kong Link 2004 Limited, <http://www.hklink2004.com.hk>

Korea Ministry of Planning and Budget, <http://www.mpb.go.kr>

Macquarie Korea Infrastructure Fund, <http://www.macquarie.com/kr/en/mkif/index.html>

Municipal Securities Rulemaking Board (MSRB), <http://www.msrb.org>

Securities Industry and Financial Markets Association (SIFMA), <http://www.sifma.org>

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