

## ORIGINAL ARTICLE

# Toward an innovative approach of financing infrastructure in Asia

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### ABSTRACT

Infrastructure development is critical for sustaining Asia's economic growth. Unfortunately, huge financing gaps—estimated by a recent Asian Development Bank study to be USD22.5 trillion—constrain the ability of most emerging Asian countries to fully realize the benefits of infrastructure development. For instance, over 70% of infrastructure investments in Asia are still funded by public resources, which pose acute financing challenges for many countries with limited budgets and fiscal constraints. This paper discusses some of the challenges associated with public financing of infrastructure projects in emerging Asian countries, before introducing some new options for alleviating their infrastructure investment needs. In particular, it proposes a new approach to infrastructure financing by utilizing the spillover effects of infrastructure investment, where additional revenues generated from such investment can be channeled back to investors as subsidy to increase the returns to their investment. The paper also argues the need for Asian countries to implement fiscal reforms and to develop a more balanced approach to financing, one that involves both the private and public sector.

**Keywords:** *public finance; financial innovation; infrastructure development*

## 1. Introduction

Infrastructure development is critical for sustainable economic growth and productivity in developing countries. According to a joint study by the Asian Development Bank (ADB) and the Asian Development Bank Institute (ADBI) (2009), the differences in infrastructure development account for a third of the overall difference in output per worker between Latin America and East Asia. They are also linked to rising income of the poor, reduced infant mortality, increased school attendance, and extended learning hours (JBIC Today, 2005). Survey results from the ADB and ADBI study (2009) reveal that access to roads and electricity was associated with increases in income in Thailand, lower poverty rates in India and Vietnam, and better health outcomes in Indonesia. The empirical literature also strongly supports the positive contribution of infrastructure in reducing economic disparities both within and across the countries and regions. As many studies have analyzed, the macroeconomic effects of infrastructure in developing countries with capacity constraints are often undermined by lack of critical infrastructure in key economic sectors.

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Unfortunately, the gains from infrastructure development are not fully realized in Asia because of huge financing gaps, estimated at around USD22.5 trillion (in 2015 prices) between 2016 and 2030, or roughly USD1.5 trillion on average per year (ADB, 2017) (Table 1). Despite efforts to diversify sources of funding, including private capital markets, the public sector remains a key provider of funds for infrastructure investments in Asia over the years. Around 70% of those investments are funded by government funds, with the remaining 20% of financing made by the private sector and 10% by multilateral agencies (Das and James, 2013). As many developing countries face tremendous fiscal constraints, it becomes a challenge for them to secure a stable source of funding, resulting in underinvestment of critical infrastructure. Thus, there is a need to better understand the current fiscal constraints in Asia by examining the impediments and challenges in public finance (*e.g.*, governance issues), as well as new sources of public finance that can be identified (*e.g.*, using tax revenues to refinance infrastructure, institutional investor funds, *etc.*) to promote greater infrastructure investment in emerging Asia.

**Table 1.** Ranking of economic corridors based on economic benefits and costs for China

Region/ Subregion	Projected Annual GDP Growth	2030 UN Population Projection (billion)	2030 Projected GDP per Capita (2015 USD)	Baseline Estimates		Climate Change - djusted Estimates	
				Investment Needs (billion)	Investment Needs as Percentage of GDP	Investment Needs (billion)	Investment Needs as Percentage of GDP
Central Asia	3.1	0.096	6,202	492	6.8	565	7.8
East Asia	5.1	1.503	18,602	13,781	4.5	16,062	5.2
South Asia	6.5	2.059	3,446	5,477	7.6	6,347	8.8
Southeast Asia	5.1	0.723	7,040	2,759	5.0	3,147	5.7
Pacific	3.1	0.014	2,889	42	8.2	46	9.1
<b>Asia and the Pacific</b>	<b>5.3</b>	<b>4.396</b>	<b>9,227</b>	<b>22,551</b>	<b>5.1</b>	<b>26,166</b>	<b>5.9</b>

Note: GDP; gross domestic product; UN; United Nations.

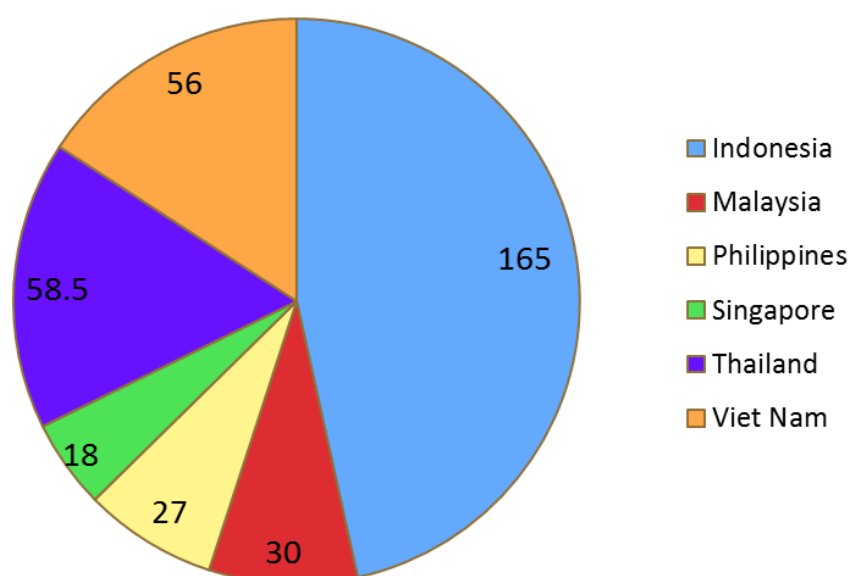
\* Pakistan and Afghanistan are included in South Asia.

\*\* Includes climate-mitigation and climate-proofing costs, but not other adaptation costs, especially those associated with sea-level rise.

Source: ADB (2017).

## 2. Challenges of public financing of infrastructure

Infrastructure financing differs from that of other assets in that infrastructure projects are often complex, involving a large number of parties and necessitating comprehensive legal arrangements to oversee risk and cost sharing. Many projects take years to finish before making any sizable profit, with the initial investments being risky with a high rate of attrition. Since the externalities or spillover effects on other sectors of the economy of infrastructure projects are not easily calculable over a short period of time, the exorbitant costs these projects incur often discourage investment (Ehlers, 2014). These constraints, coupled with the lack of “bankable” (*i.e.*, well-planned and feasible) projects, have discouraged infrastructure investment (World Bank, 2014). They have also ushered a more active role of the public sector to provide public goods and address market failures. Japan used a combination of budget allocations and dedicated revenue sources to fund massive road construction in the 1950s. Fuel tax and other tax revenues collected from vehicle users, in addition to national and local funds, were appropriated for road development, operation, and maintenance. In the Republic of Korea in the 1960s, about a third of public investment was earmarked for infrastructure investments (ADB, 2015). The same trends in public spending for infrastructure were evident in almost all countries in Asia and are likely to be sustained in the future (Figure 1).



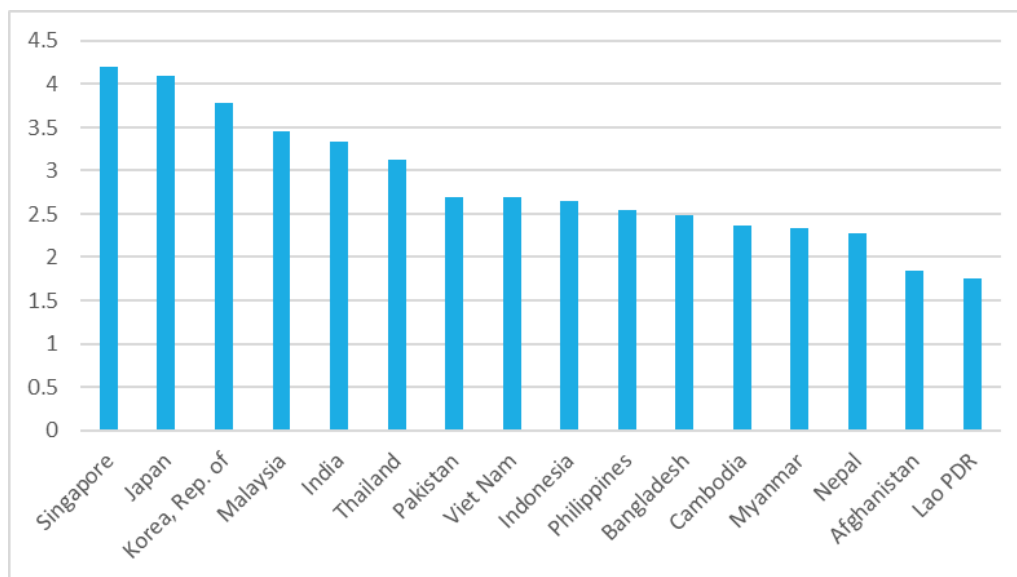
Note: ASEAN: Association of Southeast Asian Nations.

Source: PricewaterhouseCoopers (PwC) (2014).

**Figure 1.** Expected annual infrastructure spending by six ASEAN member states by 2025 (USD billion)

Indonesia, for instance, has quadrupled its public financing of infrastructure projects to over USD23 billion (IDR300 trillion) since 2009. In 2016, the government earmarked USD23 billion for the construction of 768 kilometers of national road and 11,000 housing units (Indonesia-Investments, 2015). However, the country needs to beef up its spending to around USD165 billion by 2025 to sustain its infrastructure development (PwC, 2014). In the Philippines, the government has recently increased the infrastructure budget to 2.5% of gross domestic product (GDP) while promising to raise it to 5% by 2016 (Komatsuzaki, 2016). The newly formulated Public Investment Program worth PHP3 trillion (USD64 million) by the National Economic and Development Authority focusing on "

infrastructure development in priority sectors is a step in the right direction but falls well short of meeting the infrastructure needs of the country (Mangune, 2016). Nonetheless, the state of infrastructure development remains diverse across Asia and continues to challenge efficient policy-making (Figure 2).



Note: Lao PDR: Lao People’s Democratic Republic. Rankings are on a scale of 0–5, with 5 being the best.

Source: World Bank (2016).

**Figure 2.** Infrastructure rankings for select Asian countries, 2016

### **3. Sources of financing infrastructure projects in Asia—An assessment**

In general, there are three ways of financing infrastructure projects. The first is by government financing through direct fiscal support in the form of capital expenditures or use of contingent liabilities. Countries also resort to other mechanisms, such as bond issuance, to augment public sector funds. For example, in the People’s Republic of China (PRC), the three state-owned banks have CNY8.8 trillion in outstanding bonds to finance domestic and international infrastructure projects, equaling a third of its local currency bond market (ADB, 2015). Traditionally, the Japan Finance Corporation and the Japan Bank for International Cooperation as well as the Korea Finance Corporation and the Industrial Bank of Korea have raised significant public financing for infrastructure development through bonds.

Bond financing of infrastructure alleviates the “double mismatch” of time flexibility (replacing short-term infrastructure financing through bank loans with long-term commitments) and currency exchange—the differences between project revenues generated in local currency for debt payments made in a foreign currency (Mieno *et al.*, 2009).

However, the gains from infrastructure financing through bonds remain largely untapped because several roadblocks inhibit bond market development in Asia. One obstacle is the unwillingness of local investors to support projects rated lower than A or even AA. Achieving the requisite ratings requires a higher equity investment or credit enhancement than the investors are willing to commit, prompting the borrowers to seek assistance from banks at higher prices to mitigate project risks. To resolve this issue, countries must follow minimum investment policy regulations since implementing minimum ratings can inhibit financial innovation and development of high-yield markets in emerging

economies. This would encourage domestic institutional investors to create small mandates for high-yield or infrastructure-related financing, thus creating a demand for these types of securities. Provident and government pension funds in Malaysia, for example, were crucial in developing the bond markets in early 1990s. The development of high-yield or infrastructure bonds can also stimulate demand for lower-rated projects, permitting the high-risk and high-return bonds to be sold to investors with an appetite for high risk (ADB, 2015).

Another way for countries to finance infrastructure is through private capital. Private financing comes in different forms, such as equity financing, commercial bank loans, project financing, bonds, and funds (Hansakul and Levinger, 2016). Concessional bank loans remain a pivotal source of public financing in developing countries since they offer long-term financing at below-market interest rates. The funding is also paired with technical assistance to ensure successful completion of the project, whereas some government agencies also provide matching guarantees to loans or equity investment to mitigate risks for private partners (ADB, 2015). The bank loans are more receptive than bonds in adjusting to the unforeseen delays in project construction (ADB, 2015). Banks take greater risks during the initial stage of construction, which only subside over time as projects become less risky—unlike bonds, which remain fixed over time—making debt restructuring all but impossible during the construction phase.

Apart from the conventional commercial bank loans, private infrastructure finance—with syndicated loans provided by one or more financial entities—has grown steadily in emerging Asia (excluding the PRC) over the last five years, following a slight lull during the 2008–2010 recession, comparable to private infrastructure finance in Europe and the United States. Despite these improvements, project financing by loans suffers from a lack of credit guarantees by the public sector to insure against defaults. One way to mitigate these risks is to create a mezzanine credit base with development banks whereby mezzanine creditors take a subordinate role among creditors so when the project fails or debt payments to senior creditors cannot be processed, the mezzanine debt can be converted into equity. In return, the mezzanine creditors would be compensated with higher interest rates (Ehlers, 2014).

In the last two decades, public–private partnerships (PPPs) have also become a popular infrastructure-financing source in many developing countries particularly in South Asia. For instance, in Brazil, India, and Mexico, PPPs contribute 25%–30% of infrastructure development projects. The same percentage of PPPs in Indonesia, for example, could generate USD180 billion in the next 10 years and alleviate the country’s burgeoning financial deficit (Lin, 2014). Since 2005, the Government of Indonesia has entered into PPPs in the telecommunications, oil and gas, railways, ports, and sanitation sectors amounting to USD57 billion, but only 26 out of the 48 PPP projects are under construction (Lin, 2014).

However, several bottlenecks hamper the efficiency of PPPs in emerging Asian countries. The first is the lack of transparency in allocating and prioritizing PPPs. For instance, Indonesia’s National Development Planning Agency (BAPPENAS) had reduced the number of PPPs from 100 to 27 by 2013, while the total value of the projects remained around USD46 billion without an explanation. This lack of transparency undermines credibility among private investors. PPPs typically require greater scrutiny, coordination, and risk allocation standards than public projects, which make them less desirable than public budgets and international grants. Moreover, PPPs require specialized training in financial analysis and project structuring, which many public enterprises lack when formulating contracts with private investors, resulting in lax feasibility reports that are often turned down by

the private funders. The Medan–Kuala Namu and Cileunyi–Sumedang–Dawuan projects in Indonesia, for instance, were converted into government projects after private investors’ lack of interest (Lin, 2014).

Finally, multilateral banks and other international financing institutions are also crucial partners in co-financing infrastructure projects in developing Asian countries. In the last 15 years, multilateral development banks’ (MDB) assistance to developing countries has increased from USD50 billion to USD127 billion in the form of concessional and non-concessional loans, grants, and equity investment. With the inauguration of the Sustainable Development Goals in 2015, the MDBs have pledged support of around USD400 billion between 2016 and 2018. MDBs also provide technical assistance, policy advice, capacity building, resource mobilization, and risk-sharing assessments to developing countries. According to a World Bank study, for every dollar invested in the private sector, MDBs are able to garner USD 2–5 of additional private investment (World Bank, 2015). For instance, ADB has been aiding the Government of the Philippines to effectively implement PPP projects in railways, roads, and hospitals, which have increased from just 11 in 2010 to 61 in 2015, 9 of them valued at over USD3 billion (Nakao, 2015). ADB is also collaborating with the governments of India and the Philippines and the UK’s Economist Intelligence Unit to gather information about public infrastructure projects in 11 countries in Asia and the Pacific, benchmarked with mature PPP countries such as Australia and the United Kingdom, to better identify the PPP challenges in developing countries. The financial and capacity building stimulus provided by the MDBs to developing countries, therefore, remains critical for the improvement of public infrastructure projects (Abon and Chiplunkar, 2013).

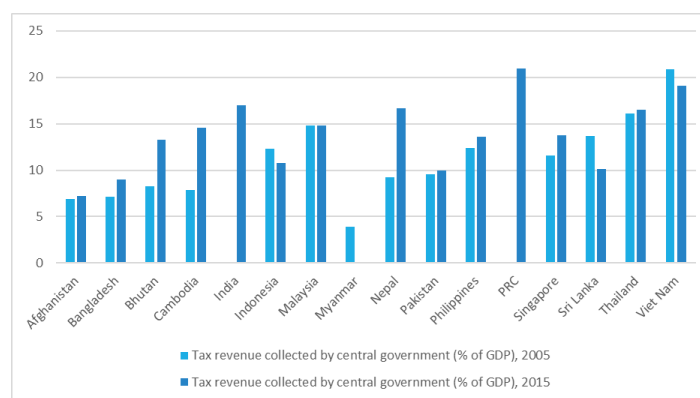
#### **4. Financing public infrastructure in Asia: In search of new solutions**

While it is unreasonable to expect the infrastructure financing gaps to be met by public resources alone, public sector spending is still particularly needed in developing countries for both the maintenance of existing infrastructure and meeting newer investment requirements for sustaining economic growth. Given the multilateral support for infrastructure in most countries, it is also likely that strong public-sector involvement can “facilitate” other forms of financing, particularly from the private sector. Many instruments for long-term investment in infrastructure, such as credit guarantees and subsidies, also have significant fiscal implications (Ahmad, 2015). For these reasons, public spending of infrastructure will continue to remain crucial. However, since the existing public financing resources fall short of the growing demand of infrastructure investments needed in rapidly developing Asian economies, a key challenge is to find new solutions and innovative arrangements for public financing.

One way to achieve this is to pursue a comprehensive tax reform agenda in order to raise the much-needed tax revenues for capital spending. Due to revenue constraints, many Asian countries, such as India, have in recent years been forced to cut back on capital expenditure for infrastructure in order to contain fiscal deficits. Evidence suggests that good revenue performance is associated with effective public investment for infrastructure. While the ability to generate tax revenues depends on country-specific conditions, raising tax revenues to 18%–20% of the country’s GDP could be ideal, which most Asian economies fall well short of.

As shown in Figure 3, the PRC is by far the only economy with a tax-to-GDP ratio of more than 20%. The increased ratio following its tax reforms in 1994, which included the institution of value-added tax (VAT), followed by channeling of funds into priority projects or “growth hubs”, subsequently increased its investment-to-GDP ratio by 51%. India, too, has followed suit and intro-





Note: GDP: gross domestic product; PRC: People's Republic of China.

Sources: Ahmad (2014); World Bank (2017) and Organisation for Economic Co-operation and Development (2015) gross domestic product estimates.

**Figure 3.** Tax-to-gross domestic product ratios

duced its own set of reforms to increase the tax-to-GDP ratio to 17% (Ahmad, 2014). However, the 18% tax-to-GDP ratio is not a definitive one and varies for each country. Emerging Asian countries similarly need to eliminate rent seeking and fill the “holes” in the personal and corporate income tax systems that only benefit “specific groups” to amass untapped tax revenues for public financing. Regional infrastructure spending has stagnated worldwide in the last decade and most emerging Asian economies will need to double their tax-to-GDP ratio to meet their infrastructure financing requirements.

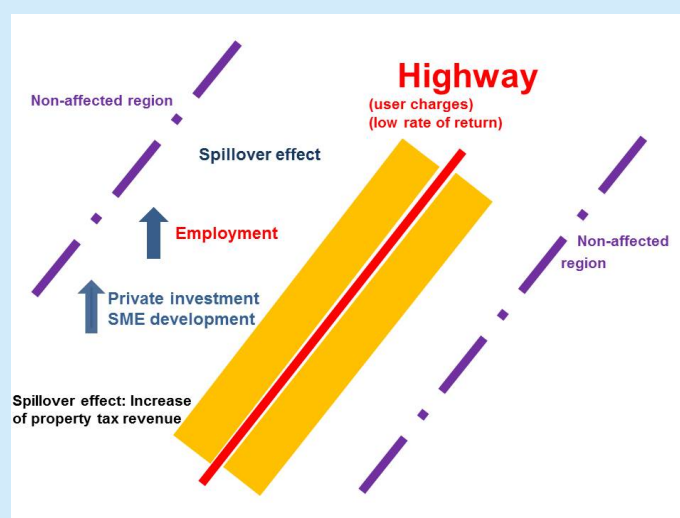
The externalities, or spillover effects, of infrastructure development through direct and indirect tax revenues must be highlighted as a vital source of public finance. The construction of highways, bridges, and ports improves communication networks, encouraging public and private businesses to locate nearby, creating economic zones, while also generating toll revenues that could be used to finance other infrastructure projects (Yoshino, 2016). By giving back part of tax revenues to the private sector in the form of subsidies or government guarantees for private financing, the private sector will be encouraged to invest more in infrastructure projects. Such infrastructure provision will then generate additional revenue and other economic effects with significant implications on long-term investments (Box 1).

For instance, the ¥1 trillion invested by Japan in infrastructure development in the manufacturing and services industries in 1990 helped attract new public and private businesses. Moreover, the Kyushu Railway line project in Japan generated between ¥76 billion and ¥97 billion in tax revenues in the two groups of cities directly affected by the railway line between 2004 and 2010. After linking the Kyushu Railway line with the Sanyo high-speed rail line in 2011, the revenues more than doubled to ¥201 billion and ¥229 billion, respectively, creating a “statistically significant” effect on the overall economy and connectivity in the Kyushu region (Yoshino and Abidhadjaev, 2015b).

Other empirical studies analyzing the spillover effects of infrastructure provision also yield positive results. In the Philippines, the construction of the Southern Tagalog Arterial Road in Batangas province generated substantial private business activity besides increasing tax collections for the province within 3–4 years (Nakahigashi, *et al.*, 2017). In Uzbekistan, the railway construction along the Tashguzar–Boysun–Kumkurgon line enabled the regional GDP in affected regions to grow by 2% due to the impact of infrastructure provision on industrial output and aggregate services (Yoshino and Abidhadjaev, 2015a).

**Box 1:** Spillover effects of infrastructure investment

The externalities, or spillover effects, of infrastructure development on economic growth are seldom highlighted as a vital source of public finance. Recent studies (Yoshino and Abidhadjaev, 2015a; 2015b; Nakahigashi, Pontines and Yoshino, 2017), however, show how good infrastructure projects can impact future investments by increasing the returns to the private sector. As shown in the Figure 4, infrastructure projects such as railways create positive effects for the affected areas by generating new businesses and markets as well as creating new jobs. These, in turn, lead to more tax revenues (*e.g.*, corporate, property, and income taxes) for the local and central governments. However, instead of simply collecting the tax revenues, governments have the option to return some of these revenues to construction firms and investors to support their investments.



Source: Nakahigashi, Pontines and Yoshino (2017).

**Figure 4.** Spillover effects of infrastructure development

Using this framework, together with econometric analysis (*e.g.*, It should be "difference-in-difference" method), it was found that the effects of spillovers on tax revenues can be huge. For example, new infrastructure investments financed by tax revenues enabled investors to increase the rate of return on their investments, by around 39%–43% in Japan and by 14%–16% in Uzbekistan (Yoshino and Abidhadjaev, 2015a; 2015b). In addition to the increased tax revenues, firms located in the region affected by the infrastructure development could also realize “productivity” spillovers. The new railways or highways, for instance, could decrease shipping costs, thereby lowering the cost of inputs without decreasing output, thus maximizing firms’ profits. Productivity spillovers could also arise from competition among firms located in the same vicinity. Chhair and Newman (2014) analyzed 500,000 enterprises in the manufacturing and service sectors in Cambodia using the difference-in-difference method and found particularly large productivity spillovers from competition among those firms in the manufacturing economy clustered around each other in economic zones versus those that are not. Overall, the large revenue and productivity spillovers from infrastructure development can potentially lure private investors for long-term investments and offer a sustainable public financing alternative for emerging Asian countries.



## 5. Conclusions

While having strong public finances is ideal for a more sustainable provision of infrastructure, the limited fiscal capabilities in developing countries, along with risk management and governance issues in infrastructure financing, are some of the main reasons a purely public intervention is insufficient to address the infrastructure bottlenecks in Asia. In reality, while public financing is still dominant, private capital is slowly gaining ground in Asia, and many instruments that are available for private financing such as bonds and credit guarantees have significant fiscal underpinnings. Thus, it appears that a more balanced approach to financing involving the private sector and governments is more likely to work.

Although the PPPs have evolved as a viable alternative for infrastructure financing, more efforts are still needed to make this scheme work better for developing countries. Since most of the drawbacks of PPPs are due to information asymmetries, incentive-compatible contracts need to be developed so that neither the governments nor the private investors will renege on their commitments. In addition, contracts need to be effectively enforced, by having a third-party arbitrator, for example, to establish the sanctity of the contracts and to mediate in case of disputes.

To gain the trust of private investors, governments must be able to demonstrate their ability to manage current and future liabilities. This is important to convince investors that infrastructure investments can be sustained over time given the levels of government finances. As suggested by Ahmad (2015), developing countries need to ensure that government liabilities (*i.e.*, both central and subcentral governments and related agencies) are regularly monitored and reported, and that annual budgets are set within a medium-term framework to ensure the sustainability of government finances.

In conclusion, as developing countries in Asia continue to face the twin challenge of financing and infrastructure development, new solutions involving both government finance and private capital need to be explored. On the part of the government, keeping the fiscal house in order is a must, while for the private sector, greater commitment to risk sharing is crucial.

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