

## THE PRIVATE PROVISION OF INFRASTRUCTURE: OPPORTUNITIES FOR EMERGING MARKETS

*Infrastructure is the backbone of every economy. It delivers basic services critical to sustainable economic growth, improved living standards, and shared prosperity. The traditional role of financing and operating infrastructure projects has been shaken up in recent decades by the emergence of Public-Private Partnerships. Designed and implemented correctly, these partnerships can bring greater efficiency and sustainability to the provision of public services such as water and sanitation, electric power, transport, and telecommunications.*

Investments in infrastructure are often large, long-term undertakings, with the cost shared among large groups of users. Infrastructure takes up physical space, whether it is bandwidth in the radio spectrum, deep-water harbors, or rights of way on land. And most infrastructure services do not easily lend themselves to competitive markets in which many producers compete to sell products or services. Instead, they often require substantial financial resources to make large, lumpy investments which are fixed by their structure and location. As a result, sunk costs are important, and revenue models to cover the upfront investments can be challenging. The cost of serving additional users declines with their number, but user payments often only cover the costs of supply over the long term, if at all. And user payments may be difficult to impose where it is impracticable to exclude non-paying users.

As a result of these constraints, funding infrastructure and organizing its operation and payments for its services has traditionally fallen to the state. In recent decades, however, many private firms have achieved a scale and sophistication that enables them to manage the construction and operation of infrastructure assets. With a few exceptions, governments have continued to be involved in these private efforts, if only to set the terms within which private firms can operate. Infrastructure is therefore a sector in which government and private enterprises have interacted in a wide variety of ways, depending on country contexts.

Affordable, good quality physical infrastructure—roads and bridges, power grids, dams and power plants, water mains, sewers, and phone networks—are key components of the

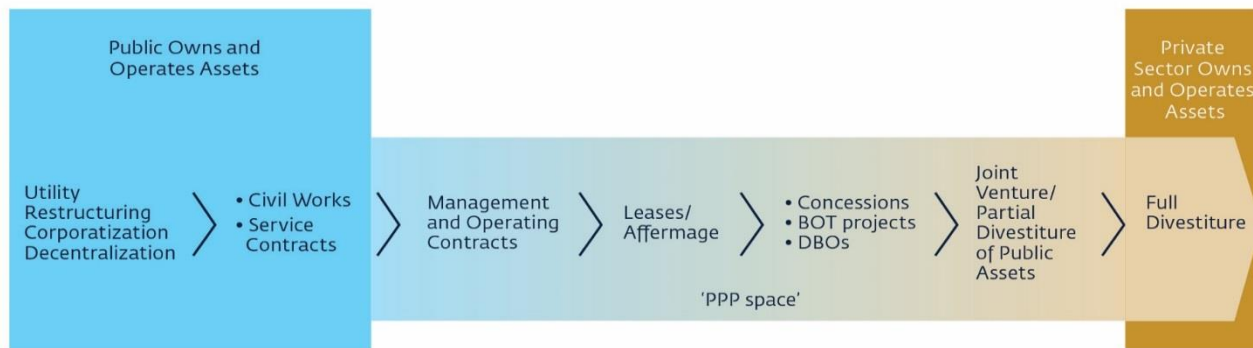
delivery of widely consumed basic services. Yet some 2.4 billion people around the world lack access to basic sanitation services, at least 663 million are without access to improved drinking water,<sup>1</sup> and 1.2 billion live without electricity.<sup>2</sup>

Infrastructure is also a critical ingredient to other economic producers. Between 25 and 50 percent of manufacturers in low and middle-income countries cite inadequate electric power as a major concern, versus just 16 percent in OECD countries.<sup>3</sup> Not only have infrastructure investments substantially contributed to increased economic growth in emerging market economies (the exception is water and sanitation where the evidence is mixed), they have helped to reduce poverty and income inequality.<sup>4</sup>

**The Role of Public-Private Partnerships.** Governments have limited fiscal space to finance infrastructure from taxation or borrowing. Beyond that, the ability to generate sufficient user fees or other revenue streams (from use of associated land, for example) is critical to the viability of infrastructure investments. Furthermore, governments typically have limited capacity to design, construct, operate, and maintain infrastructure, particularly in low-income countries, so private construction and operation of infrastructure can add value. Private investors can complement government investment, but the challenge of paying for infrastructure services—whether by taxpayers, users, or other beneficiaries—remains.

Private provision of infrastructure—of the construction of physical structures and facilities and the delivery of attendant services—ranges from independently owned, controlled and

## The Spectrum of Public-Private Partnerships



Source: World Bank, *Public-Private-Partnership In Infrastructure Resource Center* <http://ppp.worldbank.org/public-private-partnership/agreements>

operated, fully private enterprises, commonly called privatization, to a variety of public-private partnerships, or PPPs, in which various public services are contracted out to private companies. Investment commitments to private infrastructure projects in emerging markets totaled \$111.6 billion in 2015.<sup>5</sup>

It is important to understand the peculiar nature of competition in network industries such as power, water, railroads, and roads. It is often inefficient and impractical to have multiple power, water or telephone networks, especially in small markets. In these situations the scope for competition is often limited to bidding and contracting for services within a context of public-private partnerships in which local, provincial, or federal governments retain ownership and control.

Water and sanitation, rail, and road are the network industries least conducive to multiple providers. By contrast, electric power and telecommunications, spurred in recent decades by competition and “creative destruction” from private, profit-driven investors and new technological advances, have in many places found room for multiple providers to compete.

### Electric Power: A New, Competitive Paradigm

An estimated 1.2 billion people globally, or about 17 percent of the world’s population living mostly in rural regions of emerging markets, lacked basic access to electric power as recently as 2013.<sup>6</sup> Service is unreliable for hundreds of millions more. As noted earlier, between 25 and 50 percent of manufacturers in emerging markets cite inadequate power infrastructure as a major concern, and it is a major cost driver and an overall handicap to business in general.

The goal of universal access by 2030, proposed by the World Bank and the United Nations in 2011, remains a challenge that will require estimated expenditures of \$45 billion annually, up from \$9 billion spent in 2012, mostly in public funding.<sup>7</sup>

In order to achieve universal access, countries will need to expand electrification more rapidly than the growth of their populations. While eight of the 20 countries with the largest electric power deficits in 2010 managed to do so in 2012, Sub-Saharan Africa only managed to keep pace with population growth. The largest electrification spending deficits are in three regions: Sub-Saharan Africa, which needs an additional \$17 billion invested annually, South Asia needs \$15 billion, and East Asia needs \$8 billion. It is clear that public funding alone cannot achieve complete electrification.<sup>8</sup>

As with water and sanitation (discussed below), electric power infrastructure has three links in its supply chain—generation, transmission, and retail delivery—each of which historically has been a natural monopoly in most of the world. That view however, began to change when first the United Kingdom and Chile in the early 1980s, followed by several countries in Latin America and the Caribbean, started to open their markets to competition and partial privatization. Since that time more than half of advanced, industrialized nations have introduced various degrees of competition in this sector, generally accompanied by improvements in performance, labor productivity, higher capacity utilization, and lower system losses.<sup>9</sup> Increased competition has also reduced pricing disparities between industrial and household sectors, bringing them closer to underlying costs of generation and delivery.<sup>10</sup>

Though the matter is not settled and remains subject to some debate, one study finds that the greatest successes have

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occurred where there has been privatization coupled with performance-based regulation, and where unbundled, separate markets for each of the three links in the supply chain are opened to competition.<sup>11</sup>

It is important to have in place a set of commercial laws and institutions that protect electric power as well as telecommunications investors. Private investors are reluctant to enter into contracts that lack transparency and cannot be enforced. However, the problem is not as severe in the case of electric power as in transport and water. Due to increased competition and multiple provision, governments don't require long-term contracts that detail everything that can and cannot be done under every conceivable contingency.

To date, the most extensive reforms and greatest successes in the electric power sector have been achieved in Europe, the United States, Canada, Australia, and parts of Latin America. Changes have been slower and less stable in Eastern Europe and Asia, and have been highly problematic in much of Africa.<sup>12</sup>

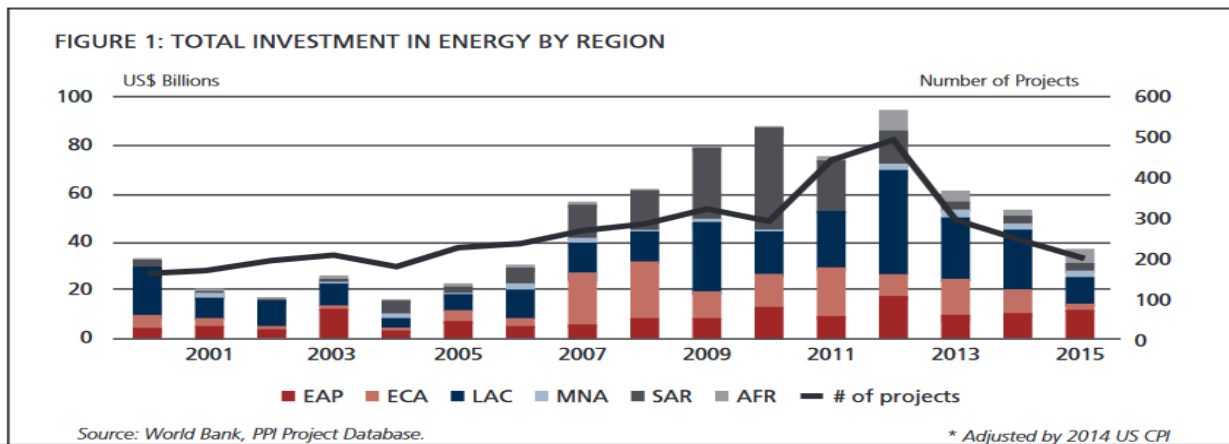
Historically, single-buyer electric power utilities negotiated long-term "take-or-pay" contracts with independent power producers. Under these contracts, the independent producer

assumes the risk of building and operating costly power plants. If expected demand fails to materialize, the utility absorbs the market risk and is required to either take the minimum contractually required amount of power or pay for it in the absence of anticipated demand.

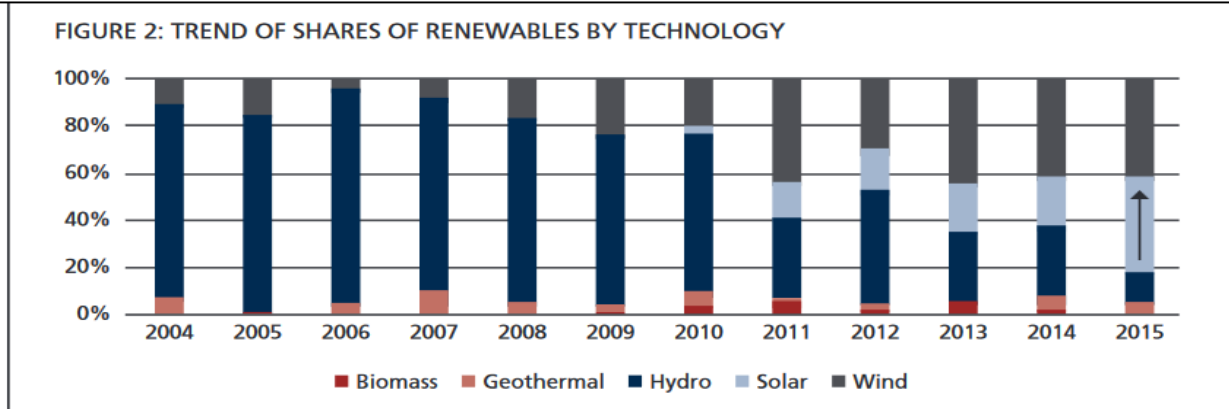
When there is competition provided by multiple independent power producers, there is no longer a need for any of them to negotiate detailed long-term contract specifications that expose them to the long-term risks of building and operating plants when demand fails to materialize. Instead they operate under a "merchant power plant" mode in which they sell their electric power on short term spot markets to multiple buyers who are no longer required to take on downside long-term market risks.

### Transport, Water, and Sanitation—Competition through a Contract

The water and sanitation and transport sectors are characterized by strong network externalities that often preclude the existence of more than a single provider. To achieve competitive pressures for performance while involving private firms and investors in construction and operation, governments may



EAP=East Asia/Pacific, ECA=Europe/Central Asia, LAC=Latin America/Caribbean, MNA=Middle East/North Africa, SAR=South Asia, AFR=Africa



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introduce a limited form of competition in which they seek competitive contract bidding while maintaining ownership and ultimate control.

This approach can be called “competition through a contract” (or “competition for the market” in comparison to “competition in the market”), which is characteristic of many PPPs. These partnerships typically consist of a long-term contract for some combination of design, construction, operation, and maintenance, with each partner sharing in the risks and rewards associated with the project. They can be a source of financial resources for investment in new capacity, and they can improve the quality, efficiency, and performance of the particular infrastructure provision. When successful, a PPP can generate long-run benefits for all parties, including governments, private investors, and end users.

These benefits derive from several sources, the most important of which is competition. While PPPs do not offer either the full-blown benefits of daily competition among multiple competitors or the ongoing threat of entry from would-be competitors, they do allow for competition in the contract bidding phase. Ideally, the bidder that offers the most and best-quality services at the lowest cost earns the right to design, build, operate and/or maintain the public good. Such competition, while never perfect, can provide strong incentives to cost and performance innovations that are often lacking within perpetual in-house monopolies.<sup>13</sup> Well-designed PPPs exploit two major sources of competitive advantage vis-à-vis publically built and operated monopolies: risk-sharing with private investors, and bundling.

**Bundling** allows private investors to profit from synergies among the joint design, construction, maintenance, and management phases of an infrastructure project. Well-designed, well-built roadways and water and sanitation systems improve the performance and lower the costs of operation and maintenance. Such incentives are much weaker for government providers that don’t have the same profit-seeking incentives and who suffer from the problem of time inconsistency, that is, the behavior of governments inclined to pursue short-term goals ahead of long-term welfare maximization.<sup>14</sup> For example, the state can skimp on infrastructure construction and maintenance because the effects of reduced service quality will not be immediately visible, and use the money saved for popular short-term priorities such as tax cuts. The problem of time inconsistency also explains why contracts for PPPs must be of long duration—as long as 20 to 35 years for transportation infrastructure. If a contract’s duration is too short, the private partner will not have the incentive to internalize the available synergies and will consequently underinvest.<sup>15</sup>

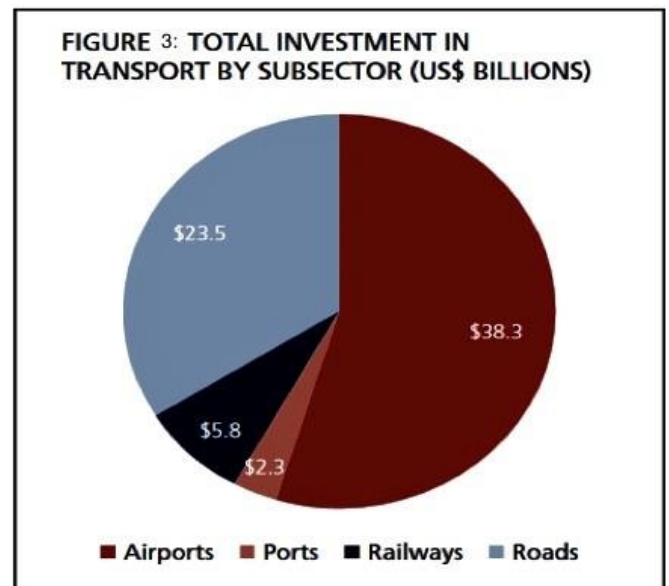
Bundling can also reduce coordination costs that various government departments or agencies face in undertaking all of

the functions performed by a vertically integrated provider.<sup>16</sup> The ideal risk-sharing arrangement holds the private partner responsible for contingencies it can reasonably anticipate (for example, annually occurring hard freezes or floods that can be expected to affect the maintenance of a road or water and sanitation facility), while the government partner takes on the risk of an earthquake, tsunami, or other uncertain and extreme events that are difficult to anticipate.

PPPs can be established with multiple private parties with some guaranteed share of the market, with another part awarded by measurable quality of service. Such partnerships must be well designed, taking into account the potential for opportunistic behavior. Examples of such behavior include a private provider underestimating costs in order to win a contract, or a government partner expanding the scope of required services beyond what was initially agreed upon (scope creep).<sup>17</sup>

Accordingly, the most successful partnership contracts are those that minimize the opportunity for either party to engage in such behaviors. Contracts must be transparent and enforceable, and backed by a sound set of legal institutions—a condition absent in many low-income countries.

**The Importance of Transportation.** Transport is absolutely critical to an economy, as it provides access to a spectrum of market actors looking to interact and compete. Today, through the power of the Internet, telecommunications has taken its place alongside transport as another source of competition.



(Numbers from 2015)

Yet roughly one billion people in emerging countries today—about 40 percent of the rural population in low-income countries—lack direct access to all-season roads.<sup>18</sup> There is

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enormous untapped potential for increased construction of roads, railways, and other forms of transport infrastructure to expand economic growth and development in these countries.

Roads and highways are the dominant transport mode for many emerging markets, accounting for more than 80 percent of the distance traveled by individuals and more than half of the distance traveled by goods.<sup>19</sup> Numerous quantitative studies show that road construction has made substantial contributions to economic growth and poverty reduction everywhere in the world. China's construction of roads and highways has been integral to its strong economic growth since 1978, which over two decades lifted more than 200 million rural Chinese out of poverty.<sup>20</sup>

PPPs are the dominant form of private investment in transport infrastructure worldwide. The sector also has more such arrangements than any other type of infrastructure. From 1986 to 2010 some 1,000 highways, bridges, railways, urban transit lines, seaports, and airports were built or rehabilitated through such partnerships, with a capital value of over \$650 billion (including all transport projects, public and private).<sup>21</sup>

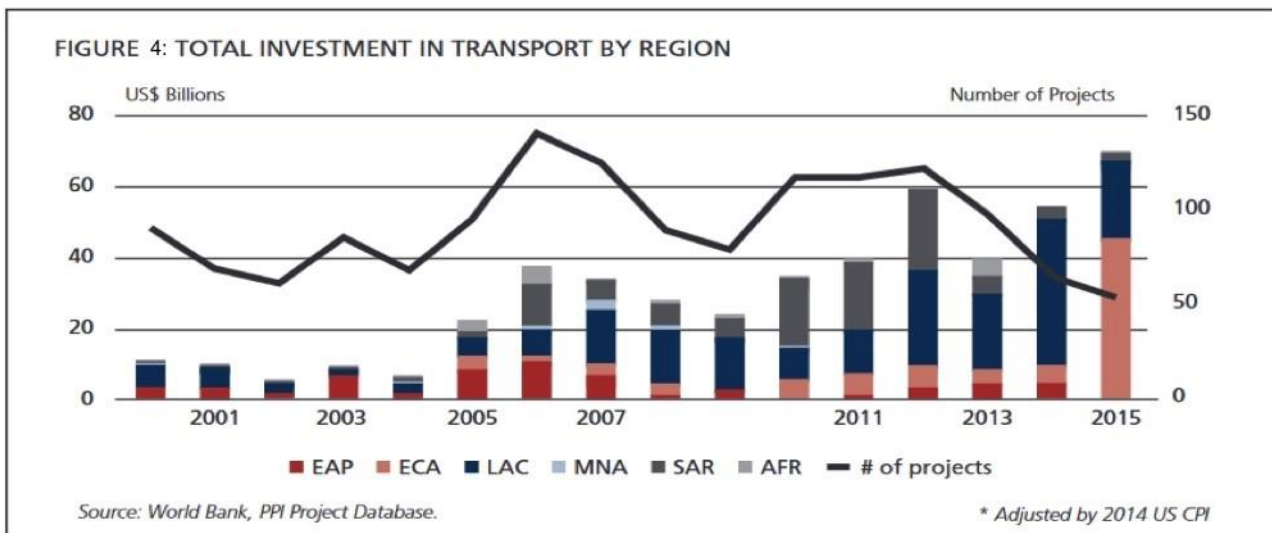
Throughout the industrialized and developing worlds, modern transport PPPs began to take off in the 1980s and 1990s; with Chile, China, Brazil and Hungary becoming market leaders among emerging countries.<sup>22</sup> Since that time private investment in infrastructure projects in low-income countries has amounted to \$180 billion.<sup>23</sup> In 2012, the latest year for which data is available, investments in all forms of transport infrastructure amounted to \$46 billion, an increase of 25 percent from 2002; Brazil and India accounted for nearly 80 percent of investments.<sup>24</sup>

**Water and sanitation** infrastructure, like transport, is characterized by network externalities and attendant natural monopolies at all three links in its supply chain—water and waste treatment facilities, water and sewer mains, and pipes leading to and from homes and businesses. PPPs dominate private provision for the same reasons as transport, and competition is mostly limited to what can be achieved through a contract.

In emerging economies, private investment in water and sanitation is less than 10 percent of that for transport, amounting to just \$4 billion in 2012, with 44 percent of investments in East Asia and the Pacific. Total investments, however, have risen noticeably in the past decade.<sup>25</sup> There have been a limited number of PPPs in Sub-Saharan Africa—just 51 from 1992 to 2012,<sup>26</sup> and significant additional investment, both private and public, is desperately needed. Nearly one-fifth of the five billion people in low-income and middle-income countries today lack access to safe drinking water, including six in ten residents of Sub-Saharan Africa. Some 2.4 billion people in these countries lack access to modern sanitation facilities.

Effective PPPs for transport and water and sanitation infrastructure investments in emerging countries are required to help address the basic needs of billions of people. Economic research points to efficiency gains across sectors when provision of these services moves from the state to PPPs. Still, such partnerships remain a relatively small share of total infrastructure and are now concentrated in more prosperous countries.<sup>27</sup>

A primary reason is a lack of legal and regulatory institutions in many low and middle-income countries. Private investors are wary of taking on projects without certain protections from opportunistic behavior. Of course, other factors, including



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political and economic instability, are also problematic and are closely related to the dearth of institutions promoting good governance and the rule of law.

## Conclusion

Physical infrastructure is critical to economic growth and development. Yet there is an enormous infrastructure gap in much of the world, and it is particularly acute in emerging markets. In these markets more infrastructure is needed to accommodate economic growth, population growth, and urbanization. At the same time, new infrastructure investments are needed to transition to a lower carbon economy and to make infrastructure more resilient to the effects of climate change.

The World Bank has estimated that emerging markets need to spend approximately \$2 trillion a year to meet their infrastructure needs by 2030, but are only spending \$1 trillion

a year currently.<sup>28</sup> Roughly two-thirds of private infrastructure investment in emerging market is spent in just two sectors, transportation and power generation.<sup>29</sup>

The infrastructure gap can be closed more quickly with the help of private enterprises, markets, and competition, all working in a complementary way with the state. And new technologies can provide paths that—through creative destruction—can circumvent traditional state monopolies for many basic services, opening new opportunities for private participation. ■

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## Notes

- <sup>1</sup> Based on data from the United Nations website at <http://www.un.org/sustainabledevelopment/water-and-sanitation/>.
- <sup>2</sup> Based on data from the International Energy Agency at <http://www.iea.org/topics/energypoverity/>.
- <sup>3</sup> Based on data from World Bank's Enterprise Surveys, see <http://www.enterprisesurveys.org/data/exploretopics/infrastructure>.
- <sup>4</sup> For more information on how infrastructure investment has a positive impact on reducing income inequality, see Calderón and Servén. 2008. "Infrastructure and Economic Development in Sub-Saharan Africa." Policy Research Working Paper 4712, World Bank.
- <sup>5</sup> Kasper and Saha. 2015. "2015 Global PPI Update." World Bank.
- <sup>6</sup> IEA 2015. *World Energy Outlook*.
- <sup>7</sup> IEA and World Bank 2015. *Sustainable Energy for All 2015: Progress Toward Sustainable Energy*, see page 21. For more information on sustainable energy financing, see World Bank's website at <http://www.worldbank.org/en/news/press-release/2015/07/10/se4all-expert-report-details-concrete-ways-to-boost-finance-for-sustainable-energy>.
- <sup>8</sup> Bhatia and Angelou. 2015. *Beyond connections – energy access redefined: Conceptualization report*. Energy Sector Management Assitant Program (ESMAP). World Bank. See also, IEA and World Bank 2015.
- <sup>9</sup> Kessides, Ioannis. 2012. "The Impacts of Electricity Sector Reforms in Developing Countries." *The Electricity Journal* 25 (6): 79-88.
- <sup>10</sup> Andrés, Biller, and Herrera Dappe. 2013. "Reducing Poverty by Closing South Asia's Infrastructure Gap." World Bank.
- <sup>11</sup> Kessides 2012.
- <sup>12</sup> IEA and World Bank 2015.
- <sup>13</sup> Makovsek, Hasselgren, and Perkins. 2014. "Public Private Partnership for Transport Infrastructure: Renegotiations, How to Approach them and Economic Outcomes." Roundtable Summary and Conclusions, Discussion Paper 2014/25. See page 4.
- <sup>14</sup> Makovsek, Perkins, and Hasselgren 2014, see page 4.
- <sup>15</sup> Ahmad, Bhattacharya, Vinella, and Xiao. 2014. "Involving the Private Sector and PPPs in Financing Public Investment: Some opportunities and

challenges." Asia Research Centre Working Paper 67, London School of Economics. See page 8.

<sup>16</sup> Trebilcock, and Mota Prado. 2014. *Advanced Introduction to Law and Development*.

<sup>17</sup> Makovsek, Perkins, and Hasselgren 2014, see page 9.

<sup>18</sup> World Bank 2014. "Transport: Sector Results Profile." April 9. <http://www.worldbank.org/en/results/2013/04/14/transport-results-profile>.

<sup>19</sup> For more information on highways, see Public-Private Infrastructure Advisory Facility's website at <http://www.ppiaf.org/node/767>.

<sup>20</sup> Fan and Chan-Kang. 2005. "Road Development, Economic Growth, and Poverty Reduction in China." Research Report 138, International Food Policy Research Insitut. See page 9.

<sup>21</sup> Siemiatycki, Matti. 2013. "Public-private partnerships in mega-projects: success and tensions." In *International Handbook on Mega-Projects*, edited by Priemus and van Wee, 133-157.

<sup>22</sup> PPIAF (Public-Private Infrastructure Advisory Facility). 2009. "Toolkit for Public-Private Partnerships in Roads and Highways." Washington, DC: PPIAF. <http://ppp.worldbank.org/public-private-partnership/library/toolkit-public-private-partnerships-roads-and-highways>.

<sup>23</sup> Ahmad et al. 2015, see page 9.

<sup>24</sup> Ahmad et al. 2015, see page 3.

<sup>25</sup> Ahmad et al. 2015, see page 3.

<sup>26</sup> World Bank 2014. "Water PPPs in Africa." Washington, DC: World Bank. [https://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/ppp\\_testdumb/documents/africa\\_water\\_ppps\\_in\\_africa\\_en.pdf](https://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/ppp_testdumb/documents/africa_water_ppps_in_africa_en.pdf).

<sup>27</sup> Trebilcock and Rosenstock. 2015. "Infrastructure Public-Private Partnerships in the Developing World: Lessons from Recent Experience." *The Journal of Development Studies* 51 (4): 335-54.

<sup>28</sup> Ruiz-Núñez and Wei. 2015. "Infrastructure Investment Demands in Emerging Markets and Developing Economies." Policy Research Working Paper 7414, World Bank.

<sup>29</sup> Trebilcock and Rosenstock 2015, see page 341.

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