POLICY BRIEF

Infrastructure for Development: Meeting the Challenge

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This policy paper is intended to inform decision-makers in the public, private and third sectors. It has been reviewed by at least two internal referees before publication. The views expressed in this paper represent those of the author(s) and do not necessarily represent those of the host institutions or funders.

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Infrastructure for development: Meeting the challenge

The Centre for Climate Change Economics and Policy (CCCEP) was established in 2008 to advance public and private action on climate change through rigorous, innovative research. The Centre is hosted jointly by the University of Leeds and the London School of Economics and Political Science. It is funded by the UK Economic and Social Research Council and Munich Re. More information about the Centre for Climate Change Economics and Policy can be found at: http://www.cccep.ac.uk

The Grantham Research Institute on Climate Change and the Environment was established in 2008 at the London School of Economics and Political Science. The Institute brings together international expertise on economics, as well as finance, geography, the environment, international development and political economy to establish a world-leading centre for policy-relevant research, teaching and training in climate change and the environment. It is funded by the Grantham Foundation for the Protection of the Environment, which also funds the Grantham Institute for Climate Change at Imperial College London. More information about the Grantham Research Institute can be found at: http://www.lse.ac.uk/grantham/

The Intergovernmental Group of Twenty-Four on International Monetary Affairs and Development (G-24) was established in 1971. The purpose of the group is to coordinate the position of developing countries on monetary and development issues, particularly issues on the agendas of the International Monetary and Financial Committee (IMFC) and the Development Committee (DC), and to ensure increased representation and participation of developing countries in negotiations on the reform of the international monetary system.

The Global Green Growth Institute was established in 2010 and became an international organization in 2012. It is dedicated to supporting developing and emerging markets to explore the challenges and opportunities of green growth in meeting their development objectives. It is headquartered in Seoul, the Republic of Korea, and operates in over twenty countries across the world. It is funded by developed and emerging countries governments.

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I. EXECUTIVE SUMMARY

Many emerging markets and all low-income countries require a major step increase in infrastructure investment to alleviate growth constraints, respond to urbanization pressures and meet their crucial development, inclusion and environmental goals.

In aggregate, the incremental investment spending across emerging markets and developing countries is estimated at around $1 trillion a year more than what is currently spent. Electricity, water (upstream and downstream) and transport are expected to account for the bulk of the spending needs.

In addition to the scale of the requirements, the financing of these infrastructure investments poses a number of challenges. Apart from normal commercial and physical risks, greenfield infrastructure projects require large risk capital for upfront investment associated with the development and construction phase. Additionally, many projects face risks around revenue streams associated with policy uncertainties and affordability (e.g. water fees) making many projects unbankable.

Infrastructure projects in developing countries also often face substantial macroeconomic and project level risks, with social returns often exceeding market returns due to externalities. Appropriate concessionality of financing and support for end-users through measures such as life line tariffs and direct income support may be appropriate to address these issues.

Infrastructure projects will have a large impact on determining environmental sustainability. Between 10-15% of the required infrastructure investment could be attributed to making such investment sustainable, by ensuring lower emissions, higher efficiency and resilience to climate change. While this is an additional upfront cost, the net macroeconomic effect of these additional investments, thanks to efficiency improvements and wider economic benefits (including energy security, safety, cleaner methods, biodiversity and technological discovery as well as fundamentally reduced climate risk), can be strongly positive.

Current spending on infrastructure in developing countries is approximately $0.8-0.9 trillion per year, of which the majority is financed directly by domestic budgets. The remaining annual financing is provided by a mix of private sector institutions, developed country ODA, MDBs and, more recently, by emerging countries such as the BRICS.

In order to meet the large infrastructure development needs, annual infrastructure spending will have to more than double by 2020.
Domestic budgets will continue to play an important role, but the amount they can take on will inevitably be constrained by macroeconomic considerations regarding sustainable levels of debt and affordability.

The existing architecture is deficient in providing financing on the scale and with the characteristics needed. A major gap in the system is the lack of adequate project preparation facilities in order to identify and develop a prioritized and viable pipeline of projects especially in low-income countries.

MDBs also have cumbersome and costly project preparation requirements, tend to be too risk-averse in the projects that they are willing to finance and do not have adequate instruments to crowd-in private investment or address policy risks. They are often also unable to adequately assess risk-return profiles, deal with uncertainties of revenue streams and hold assets in appropriately diversified, large portfolios. MDBs are taking steps to address many of these gaps, but it is clear that they will face capital, governance and other constraints in responding to the scale and urgency of the challenge.

A New Development Bank for Infrastructure and Sustainable Development could provide a new channel through which developing country governments could borrow to finance economically productive infrastructure assets - whilst still remaining within prudent levels of debt. In addition, a new institution could make up for the deficiencies of the existing architecture and help catalyze the private sector investments required.

The financing gap for infrastructure coexists with excess savings in the global economy including a growing pool of savings in developing and emerging countries. These savings from developing and emerging countries should be used for financing unmet needs in developing and emerging countries. Currently they get very low returns from allegedly safe investments in developed countries bonds. The challenge is to transform the excess savings into stable, predictable and scaled finance while providing investors a safe high quality asset.

This reallocation of savings will need to be done in the context of tackling current macroeconomic imbalances. While initially the extra investment would come largely from the pool of extra savings worldwide, some would come from a recovery in demand and a better reallocation of savings. Future higher savings would be associated with the incremental growth from the investments in infrastructure.

Given the scale of the gap, a broad-based effort is warranted to revamp global, regional and national institutions. A new Development Bank for Infrastructure and Sustainable Development could play an important direct and catalytic role in this effort.

It could serve as a vehicle that can reduce and absorb part of the up-front risk, finance key bottlenecks in the project pipeline, generate sufficient knowledge and reputation through scale, encourage investment flows in early stages and unlock investment opportunities in later stages. It could be a key convenor and syndicator of programs in a way that closely involves the private sector and other public institutions such as development banks and sovereign wealth funds. This institution would therefore augment badly needed stable, predictable and appropriately scaled long-term supply of finance for infrastructure.

II. THE NEED FOR SCALED-UP INFRASTRUCTURE INVESTMENT IN THE DEVELOPING WORLD

Many emerging markets and most low-income countries require a major step increase in infrastructure investment to alleviate growth constraints, respond to urbanization pressures and meet their crucial goals for inclusive growth, development, and sustainability.

There is a well-documented infrastructure deficit in many developing and developed countries, which is hampering growth prospects.[1)] Strategic infrastructure, from roads and ports to energy are needed to fuel growth. An estimated 1.4 billion people still have no access to electricity, 0.9 billion are without access to safe drinking water and 2.6 billion without access to basic

1) MDB Working Group on Infrastructure (2011), Supporting Infrastructure in Developing Countries, Submission to the G-20; Estache (2010); Bhattacharya and Kharas (2011); Fay and Toman (2010).

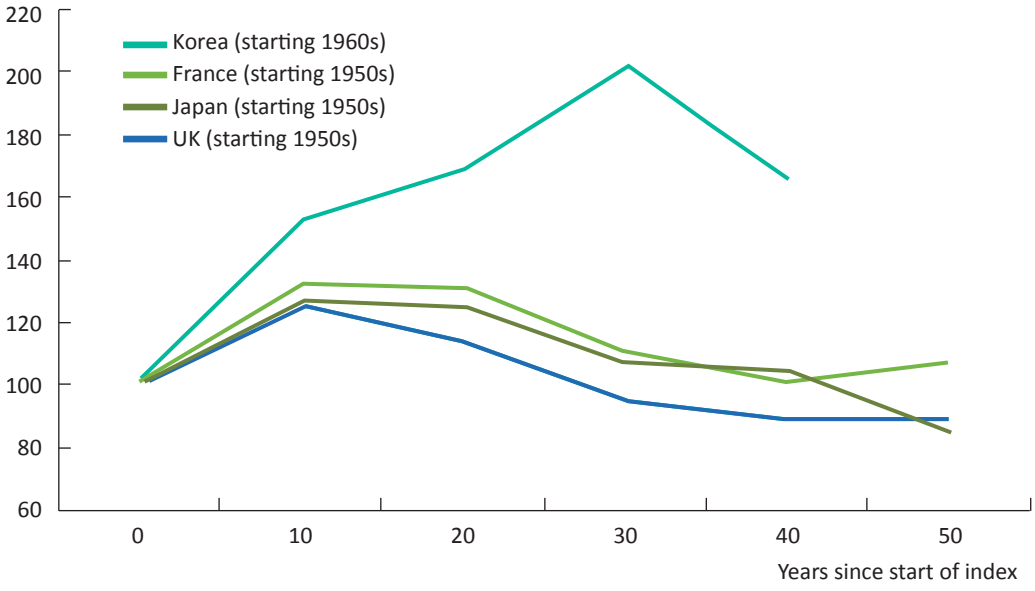
sanitation. These deficits continue to pose substantial challenges in low-income countries, but there are also pervasive deficits in many middle-income countries.

Developing countries need a step increase in infrastructure investment to accelerate economic growth and development.

There is extensive evidence that infrastructure development can increase economic growth and reduce levels of inequality.[2)] As countries move from primary to secondary and tertiary sector-based economies, infrastructure becomes more important.

The experiences of developed countries highlight how a temporary boost in investment and infrastructure spending has been necessary to move to the next stage of economic growth. The figure below compares the rates of gross fixed capital formation for a selection of countries over time. A significant increase in gross fixed capital formation was observed during these countries' growth periods before returning to lower levels.

■ **Comparison of Rates of Gross Fixed Capital Formation across Countries**



NOTES: Index of gross fixed capital formation over time (start dates of series provided in brackets)
SOURCE: Gross Fixed Capital Formation data for UK, Japan, and France taken from McKinsey Global Institute, "Farewell to Cheap Capital"; for South Korea data is from World Bank

2) For example, an extract from a recent IMF working paper (Mwase and Yang, 2012) notes that "Two recent surveys of the empirical literature (Agénor et al. (2006) and Straub (2008)) conclude that the majority of studies, covering a broad range of countries, find that the stock of infrastructure assets has a positive impact on the rate of economic growth, with the largest impact coming from telecommunications, roads, and electricity networks".

In addition, there are a number of structural reasons to believe that the size of the required infrastructure increase is greater today than it has been in the past.

First, since global trade is playing an ever increasingly important role in countries' development, so too must infrastructure. This includes the traditional transport infrastructure such as roads, railways and ports, as well as, increasingly, information technology infrastructure such as broadband networks to facilitate better integration of supply chains and international trade in services (e.g., in outsourcing services). As developing countries develop their manufacturing and services sectors, the intensity and quality of infrastructure becomes much more important in order to exploit network externalities.

Second, the rapid pace of urbanization necessitates a greater infrastructure requirement than before. Between 2010 and 2030 world population will have increased by 2 billion, from 6.1 to 8.1 billion. Most of this will be in the developing world, and virtually all of this will be in urban settlements. Responding to these urbanization pressures will require a major increase in infrastructure spending.

Third, the need to ensure the environmental sustainability of our economies necessitates a greater role for infrastructure and its related networks. This requires limiting the environmental impacts of infrastructure assets, adapting them to a changing climate, and designing them intelligently to promote environmentally sustainable lifestyles more broadly in the economy. Long-lived infrastructure assets (sometimes of up to 100 years) will play a major role in determining the readiness of our societies and economies for these environmental issues.

Lastly, developing and emerging markets have under-invested in maintenance of current infrastructure over the last decades: while estimates are difficult, substantial additional funds will be required to raise the levels of maintenance.[3)]

3) See Ascher (2009).

While it is inherently difficult to make precise estimates in part because of the gaps in data, investment spending in infrastructure (excluding operation and maintenance) in developing countries will need to increase from approximately $0.8-0.9 trillion per year currently, to approximately $1.8-2.3 trillion per year by 2020, or from around 3% of GDP to 6-8% of GDP.[4] This includes about $200-300 billion to ensure the infrastructure results in lower emissions and is more resilient to climate change.

Taking data limitations into account, estimates indicate that investments of between $1.25-1.5 trillion per year (2008 constant prices), or 5-6% of developing country GDP, are required in 2013 to sustain economic growth.[5] At an expected GDP growth rate of 4% per year, this would imply investments of $1.6-2.0 trillion annually by 2020.[6] These are conservative numbers, based on steady state forecasting assumptions. If we believe in the structural reasons that would warrant a step increase in the need for infrastructure in developing countries, the resulting numbers could be significantly higher.

It is difficult to estimate what scale of funds will be required to ensure that all infrastructure investment is of lower emissions, higher efficiency and more resilient to climate change. Bottom up estimates suggest that, by 2020, approximately $100-200 billion of annual capital investments in mitigation technologies will be required to reach a 450 ppm pathway. Adaptation estimates could add up to an extra $70-100 billion on top of that.[7] Overall this points to a range of $200-300 billion annually. Top-down estimates from the World Bank and others arrive at similar capital requirements.[8] Again, these are conservative assumptions; more severe climate change (e.g., of 4°C warming by the end of the century as many believe we are headed[9] would require much stronger measures and actions to contain the risk of substantial climate-related damages. Whilst

4) Estimates adapted from Fay et al. (2011), where $1.25-1.5 trillion is estimated as the requirement for 2013. The $1.8-2.3 trillion estimate for 2020 is calculated assuming a 4% GDP growth rate from 2013-20 and an additional $200-300 billion annual capex requirement to make infrastructure investments sustainable.

5) 10Fay et al. (2011).

6) Operation and maintenance requirements are not included. If they were included, these figures would approximately double.

7) See International Financial Support to Address Climate Change. Climate Policy Special Edition(2011). In particular, Olbrisch et al. (pp. 970-986) and Narain et al. (pp. 1001-1019). See also Project Catalyst (2010).

8) Fay et al. (2011).

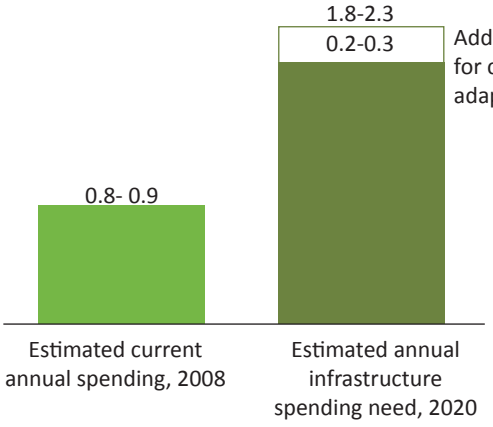
9) See UNEP (2010) and UNEP (2011), for a review of studies in this area.

these are incremental costs that would not have occurred in the absence of the challenges posed by climate change, at a project level, they cannot be separated from the rest of the infrastructure investment as they are an integral part of what makes infrastructure viable and resilient over time.

This would therefore add up to a total requirement of $1.8-2.3 trillion or more a year by 2020, approximately $1 trillion more per year than what is currently being spent. This would be in-keeping with experiences of fast growing developing nations over the past 25 years, such as South Korea and China, which have invested an even higher share of GDP in infrastructure investments for decades.[10)]

Note that these figures do not include spending requirements for ongoing operation and maintenance of infrastructure assets. Including these costs could approximately double the annual spending requirement.[11)]

■ **Annual Infrastructure Spending in the Developing World ($tr, 2008)**



NOTES : $ trillion per year, (2008 real prices), capital investments only (excl. operation and maintenance costs)
SOURCE : Current spending taken from Fay et al. (2010), "Infrastructure and Sustainable Development"; Estimated annual infrastructure spending need for 2020 calculated by taking the Fay et al (2010) estimate of $1.25-1.5 trillion annually in 2013 and assuming a 4% annual growth rate from 2013-20, and an additional $200-300 billion annual requirement to make the infrastructure sustainable (both mitigation and adaptation);

East Asia will require the majority of this investment (35-50%), with lower amounts required in other regions. Some 85% is expected to be required in low- and lower-middle income countries.[12)] Approximately 45-60% of the investment requirement will be in the electricity

10) See Commission on Growth and Development (2008).

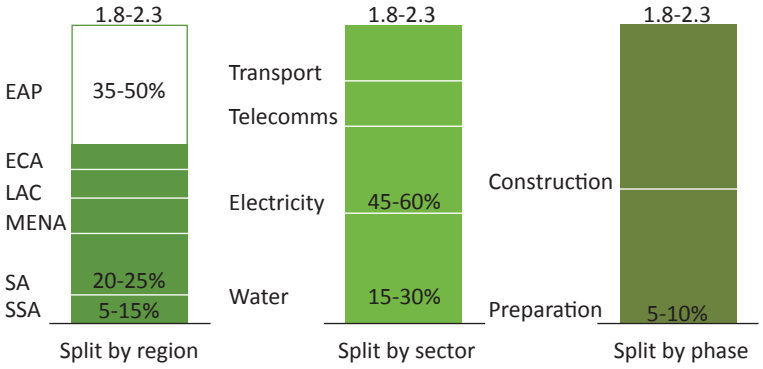
11) See, for example, Yepes (2008) and Fay et al. (2011).

12) The split of investments by region has been calculated based on ranges from studies including Yepes (2008) and the MDB G-20 Working Group on Infrastructure (2011).

sector, including generation capacity, transmission and distribution networks.[13] The remainder is split relatively equally between the transport, telecoms and water sectors. Note that were maintenance requirements to be included, a greater share of the total investment would be required in the transport sector, where existing stocks are relatively high, although the energy sector would still be the leading source of maintenance requirements.

These aggregate figures hide differences between the types of investments made at different phases of projects. At a project level, infrastructure costs include both preparation costs and construction costs (as well as operation and maintenance costs, which are not included in the above figures). For projects where limited experience exists (e.g., in a new technology or in a low capacity country), preparation costs, including costs of design and arranging financial support, can constitute up to 10% of overall investment costs.[14] For other projects, preparation costs are lower. At an aggregate level, this could suggest somewhere in the region of $100-200 billion per year to be spent on the preparation stage of projects. The different stages of investment will typically require different types of finance - with preparation phases requiring higher shares of equity investment and patient capital.

■ Annual Infrastructure Spending Requirements in the Developing World ($tr, 2008)



NOTES: $ trillion per year, (2008 real prices), capital investments only (excl. operation and maintenance costs)
SOURCE: Estimated annual infrastructure spending need for 2020 calculated by taking the Fay et al (2010) estimate of $1.25-1.5 trillion annually in 2013 and assuming a 4% annual growth rate from 2013-20, and an additional $200-300 billion annual requirement to make the infrastructure sustainable (both mitigation and adaptation); the split by region, sector, and phase are authors' own calculations taking ranges from Yepes (2008), MDB G20 working group on infrastructure (2011), and Foster and Briceño-Garmendia (2010); note the $200-300 billion annual requirement for sustainability is assumed split in the same ratio as the other investments across regions, sectors and phases

13) The split of investments by sector have been calculated based on ranges from studies including Yepes (2008), the MDB G-20 Working Group on Infrastructure (2011), Foster and Briceño Garmendia (2010), and Bhattacharya and Kharas (2011).

14) The MDB Working Group on Infrastructure (2011).

The cost of finance is a key driver of the overall cost of delivering infrastructure, and is primarily driven by the nature of the risks associated with the delivery and operation of infrastructure

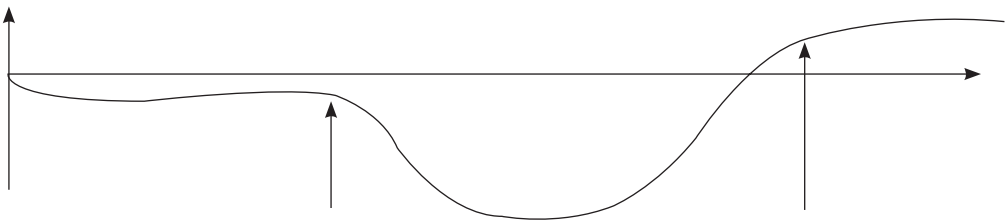
The financing of the investments can be provided by a mix of government budgets, private sector and, in some cases, international public finance. Each of these financiers will have a suite of products at their disposal to finance and will be concerned with the returns they get from their investment and the risks inherent in that financing. Therefore, the investment in infrastructure can be translated into a financing need where a risk-adjusted expected return can be calculated.

The risk-return profile of projects will change substantially, both according to the nature of the project and according to the phase the project is in. For each of these combinations, financiers will have to provide different types of finance, which match the risk-return profiles as well as cash flow. Higher risks will of course lead to higher costs of financing, particularly if commercial finance is required.

The figure below provides an illustration of the risks and financing decisions at each stage of a project's life-cycle.

■ Risk and Financing Considerations at Different Phases of the Life-Cycle of an Illustrative Infrastructure Project

Illustrative infrastructure project life-cycle with risk and financing considerations detailed

	Preparation	Construction	Operation
Description	Developer/government organizes feasibility studies; models cash flows, finances; organizes contracts with utilities, operators and construction firms	Construction firms build theproject to specifications	Separate operating company takes over operation and maintenance of the project
Main risks	• Macroeconomic & political risks • Technical risks to project viability • Environmental and planning risks	• Macroeconomic & political risks • Construction risks (e.g., of overrun, delay)	• Macroeconomic & political risks Demand / traffic risks • Operating risks ! Policy risks (e.g., tariff changes)
Cash flows (stylized)			
Financing moments		Once project is 'bankable' the developer will seek equity investors and debt providers to finance the project	Once construction is complete and started to operate project can be refinanced to reflect the changing risk profile

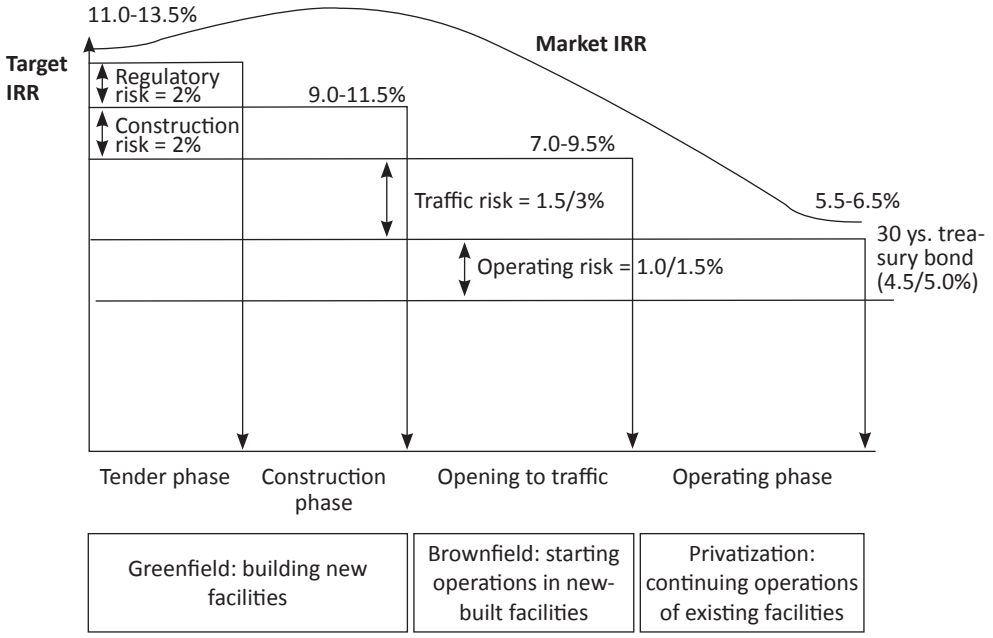
The main categories of risk include[15]:

- ***Macroeconomic* risks:** including risks to economic growth, which may prevent individuals from paying user fees or from governments paying subsidies, as well as risks of inflation and exchange rate fluctuations.
- ***Political* risks:** including changes in policy frameworks, administrative barriers, corruption, regulatory barriers, rule of law, instability, civil unrest and the nationalization of infrastructure assets.
- ***Technical* and preparation-phase risks:** including risks associated with the suitability of the chosen project site (e.g., the wind strength of sites chosen for wind farms), or of the technology itself.
- ***Construction-phase* risks:** including risks of cost escalation or construction over-run (e.g., due to changes in building permits or local opposition), leading to a delay in revenue streams.
- ***Revenues* risks:** arising from regulated prices, usually denominated in local currency terms, risks that forecasted demand does not materialize, or that revenue flows are lower than expected (e.g., lower than expected traffic on new toll roads, reduction in tariffs for a power project, etc.).
- ***Operating* risks:** including risks of escalating operating costs (e.g., from feedstuffs) or of under-performance of a technology.

Whilst the categories of risk are more or less prevalent at different stages of a project's life, investors in the early phases need to consider all risks across the different stages of the project- since a return on their investment will only be possible if the return profile of the later stages of the project life are sufficiently attractive to make up for the early stage risks. As the project progresses, earlier categories of risk (e.g., technical and environmental risks) become less relevant, reducing the overall risk-profile of the project. The figure below provides an example of the risk-return profile for a typical road project across its different stages.

15) A vast literature exists on investment in fixed assets under uncertainty. For a theoretical framework see Dixit and Pindyck (1994). Chapter 12, on applications and empirical research, offers some empirical evidence related to infrastructure investment and timing of environmental policy.

EXAMPLE: **Internal Rate of Return (IRR) for Road Projects and Key Risks across Different Phases**



SOURCE: Analysis based on data from Atlantia SpA - www.atlantia.com

Infrastructure investment projects in developing countries have high risks across most or all of the above categories. This problem is compounded by the fact that many potential financiers have few if any benchmark projects to serve as comparison for pricing these risks.[16] It is therefore often difficult to identify matches of project and financial archetypes, making investment at scale unfeasible. At the macro level, the prospective increase in the scale of 'greenfield' investments that are required in developing countries - which typically have higher risks than 'brownfield' expansions - means that the risks of a substantial bottleneck where financiers are not ready to invest are greater.

To compensate for these higher risks for investment in developing countries, investors and financiers demand high returns on their capital to compensate for these risks, or they stay away altogether. In Africa, for example, investors may require a 20% return on equity invested in infrastructure whilst commercial lenders might demand up to 10%.[17] In some cases returns demanded can be even higher.

16) See Romani and Kaminskaite-Salters (2010).

17) See PIDG's testimony to the House of Commons' International Development Committee, Ninth Report of Session 2010-12, Volume 1 (2011).

Where financing is in principle available, the scale of the investment and the cost of finance compound to produce issues of affordability, which prevent many infrastructure projects from being built.

Ultimately, infrastructure investments are paid for by end-users (through fees) or tax payers (through taxes that pay for subsidies), or by some mix of the two. An issue of affordability arises when the costs of developing the infrastructure are too high for the end-users or taxpayers to burden - at least in the short term, before the full economic benefits of those investments are experienced. At times, foreign taxpayers can step in through ODA or other concessional finance to overcome this challenge and shoulder some of the burden. Another important reason why subsidies may be justified is when social rates of returns exceed market rates of return. This is often the case when infrastructure contributes to reducing negative externalities, for example by reducing GHG emissions, or when it produces positive externalities that are difficult to charge for, e.g. through a street lighting system.

A very approximate indication of affordability can be calculated by simply dividing the estimated infrastructure investment requirements by the population of each region.[18] Using our numbers for total investment needs by region, this would amount to an approximate payment of 0.40 dollars per day in Sub-Saharan Africa, or 0.50 dollars per day in South Asia - equating to potentially 25-50% of individual income in these regions where a significant proportion of the population lives off less than $1-2 per day[19] - and this excludes the cost of finance. Even if this investment is not paid in cash, affordability represents a significant constraint on revenue streams especially when operations and maintenance costs are taken into account. When costs of financing are taken into account, which can be substantial in developing countries (on account of the greater risks already mentioned), this picture looks even bleaker. To illustrate the point, imagine a $1 billion project financed 70% by debt and 30% by equity. Assume the debt is repaid in full (principal + interest) over ten years with an interest rate of 10% and the equity investors expect an annualized return of 20% over that period. Under these assumptions the total of the financing payments for the $1 billion project could reach almost $2 billion over the ten years - i.e. nearly double the project cost. At an interest rate on debt of 5% and a return of equity of 15%, by comparison, payments would be $1.5 billion over the next 10 years. Whilst these are at best illustrative approximations of the critical issue of affordability, they indicate the scale of the challenge for many countries and how these challenges are amplified when risks are higher.

18) This approach is based on Estache (2010).

19) Author's own calculations following the approach used in Estache (2010).

The issue of affordability is, of course, not new. Countries across the developing and developed world have tried to resolve the issue mostly through subsidies and, more recently, through other mechanisms such as cash transfers (e.g., Bolsa Familia in Brazil[20]). Irrespective of whether such measures are desirable or not, they introduce a layer of political uncertainty on the sustainability of user fees: will subsidies be removed or reduced? Will the government have enough liquidity to pay out cash transfers for the foreseeable future? These are the questions that are preventing investors from participating in many infrastructure projects that depend, for their returns, on such revenue streams.

III. THE CURRENT GAP IN FINANCING AND INTERNATIONAL INSTITUTIONS

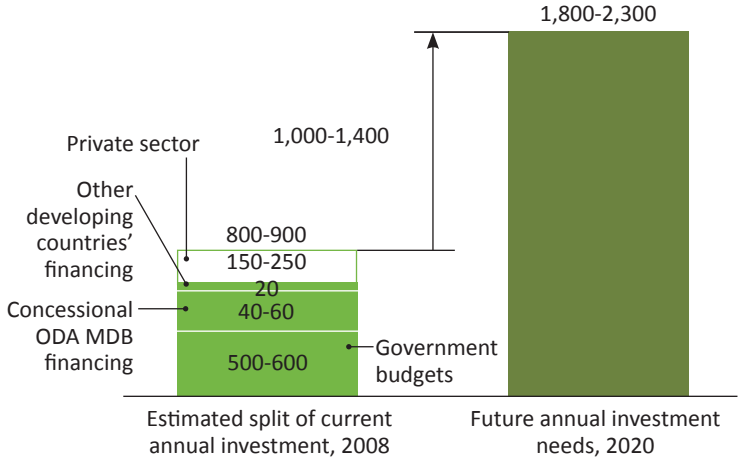
Currently, an estimated $0.8-0.9 trillion is invested annually, mostly financed by public sector budgets, with lesser shares provided by the private sector and foreign countries through development finance.

Of the estimated $0.8-0.9 trillion per year invested currently, the majority ($500-600 billion) is financed by domestic government budgets, 20-30% (approx. $150-250 billion) by the private sector, an estimated 5-8% (approx. $40-60 billion) through developed country ODA and MDB financing, and perhaps 3% (less than $20 billion) from other developing country governments - as shown in the figure below.[21]

20) See Bastagli (2011). Such transfers have been used for health and education but they could be extended to infrastructure services.

21) These figures are the authors' own estimates based on a number of sources including: Estache (2010); Macquarie Bank (2009); and the MDB Working Group on Infrastructure (2011).

■ Annual Infrastructure Spending by Sources (real $bn, 2008)



NOTE: Split by sources of finance are approximate ranges only and don't add to exactly to the totals given for that reason
SOURCE: Split of current sources of finance is a G-24 own assessment based on various estimates including Estache (2010); MDB working group paper on infrastructure (2011); Macquarie (2009).

Private Sector Investment in Infrastructure

Looking more closely at the domestic private sector investment which does occur, however, the investment appears heavily concentrated in the energy and transport sectors, whilst 95% of all private finance is concentrated in middle-income countries (Estache 2010). The low levels of private sector involvement in infrastructure in low-income countries is indicative of the greater risks, both perceived and real, as well as the underdeveloped nature of local capital markets in those countries.

Non-domestic private sector investment, particularly through Public-Private Investments (PPIs), is concentrated in the Information and Communication Technology (ICT) sectors, with few other sectors benefiting from this financial instrument. Furthermore, during the recent financial crisis, PPIs outside the ICT sector dried up almost entirely. Even before the current financial crisis, PPIs had proven often difficult to execute, and have had limited success. Investment planning, policy coordination and fiscal sustainability are all issues that have proved difficult to address. Also, the burden of the investment ends up falling onto the taxpayers, particularly in capital-intensive transport and water and sanitation, due to affordability and policy risks.22)

In Africa, whilst the absolute size of private sector infrastructure investment is small (approximately $9 bn per year), it contributes the same amount as from government budgets in the region (Foster and Briceno-Garmeñdia, 2010). This is, again, heavily concentrated in the ICT sector, which receives almost two thirds of all the private sector infrastructure investment in the region.

22) Estache (2006).

Different types of investors provide very different types of capital, typically tailored to the different types of risk. In order to plug the "infrastructure gap", all of these sources of finance will need to work together in order to take on different risks and leverage each other off.

As demonstrated by the examples above, different types of investors tend to bear certain kinds of risk at certain times, for given sectors and country types. A mix of financial and non-financial incentives (e.g., upfront subsidies, output-based support, first-loss guarantees, political risk coverage, preferential tariffs, payment guarantees, policy commitments) may be required to make projects possible while pursuing a defined return - for example through commitment to Feed-In-Tariff systems or subsidy programs.

With an additional $1 trillion needed to plug the infrastructure gap by 2020, it is clear that no single source of finance or type of investor will be able to meet the challenge alone. Indeed, each type of investor will have a finite amount of capital available for infrastructure investments. Domestic governments will be constrained in the amount of debt they can sustainably take on, pension funds by the size of their pooled funds, and corporates by the size of their balance sheets.

The existing institutional architecture is deficient in meeting the scale of the challenge. First, it places conservative limits on how much debt countries can take on to finance their infrastructure and investments for growth.

The World Bank-IMF Debt Sustainability Framework provides a guideline that the present value of a country's external debt should not exceed 30-50% of its GDP and that debt servicing should not exceed 25-35% of government revenues.[23)] This threshold is, however, regarded by many experts as too low. They argue that this analysis places too much emphasis on debt accumulation and too little on the economic growth impacts of the investments, thus potentially holding back countries' growth prospects.

On average, in 2010, developing and emerging countries were already nearing this threshold, without plans for the step-increase in infrastructure investment that is required.[24)]

23) See World Bank and IMF (2010).

24) IMF, World Economic Outlook September 2011.

A more appropriate threshold for debt, and process for considering new debt, could be envisaged that better balances the growth aspects of infrastructure investments with macroeconomic concerns over sustainability of debt.

Second, existing institutional arrangements do not adequately provide the right mix and scale of finance to deliver the infrastructure investment required.

A mix of different types of finance, from different investors, is required to fund infrastructure projects.

Some investors look for fixed income-like investments. This would include all the investors in a project whose upside and downside are limited by some contractual arrangements, regardless the nature of the investment instrument used. It could include private investors that commit equity capital but limit their downside risks and upside potential through, for example, Engineering, Procurement and Construction (EPC) and Operations and Maintenance (O&M) contracts and long-term Power Purchase Agreements (PPAs). Likewise, it could include, on the public side, MDBs providing loans with a fixed interest rate.

Some investors, by contrast, look for equity-like investments. This would include all the investors who accept both the downside risk and the upside potential of a project in terms of the uncertainty on both the costs and revenues sides.

A lack of capital availability in any one of these types of finance will lead to bottlenecks that hold up financing across the other types, preventing the infrastructure from getting built. Limited analysis has been carried out on comparing the availability of each of these types of capital against what is required for infrastructure. It is safe to say that, given the difficulty in financing infrastructure currently, there are serious shortfalls in some areas. Further analysis, though, would be required to identify what types of finance have the largest shortfalls.

The existing architecture is deficient in providing financing on the scale and with the characteristics needed. A major gap in the system is the lack of adequate project preparation facilities in order to identify and develop a prioritized and viable pipeline of projects especially in low-income countries.[25)] MDBs also have cumbersome and costly project preparation requirements, and tend to be too risk-averse in the projects that they are willing to finance and

25) MDB G-20 Working Group on Infrastructure (2011).

do not have adequate instruments to crowd-in private investment or address policy risks. They are often also unable to adequately assess risk-return profiles, deal with uncertainties of revenue streams and hold assets in appropriately diversified, large portfolios. MDBs are taking steps to address many of these gaps, but it is clear that they will face capital, governance and other constraints in responding to the scale and urgency of the challenge.

A new Development Bank for Infrastructure and Sustainable Development could play an important role in overcoming these issues.

Infrastructure investment in emerging and developing countries will need to more than double over the next decade. This means a significant step-up in the amount of public and private finance flowing to these countries. Such investment will be crucial not only to ensure that emerging and developing countries meet their growth and development aspirations, but also to ensure that they lay the foundations for sustainable growth, which entails low emissions and resilient to climate change.

There are a number of significant challenges to such a step-up in investment. Significant market failures exist that impede developing countries from building substantial pipelines of high-quality, investable projects. Public and private sources of finance need to improve their ability to work together in developing countries to scale up investment flows significantly.

A new development bank, dedicated to infrastructure and sustainable development, could provide an additional channel through which developing country governments could borrow to finance economically productive infrastructure assets. While acting prudently to ensure that debt levels are sustainable, emerging and developing country governments together could achieve better leverage, both in terms of their overall lending capabilities and in terms of private finance co-investment, and thus be able to fund a greater share of their required infrastructure. They could ensure that the instruments available to such banks are wide and comprehensive, and learn from the successes and constraints of existing institutions. Such an institution could play an important catalytic role in revamping the current global, regional and national institutions dedicated to infrastructure finance.

Of course, there will still be limits to how much domestic budgets in country recipients of loans are able to borrow to finance their infrastructure. Given the serious debt problems that many emerging and developing countries have faced in the past, it would be irresponsible to take the concerns of debt sustainability lightly. As such, whilst a greater share of the finance will be able

to be borne by domestic governments, efforts will still be required to leverage other forms of finance to deliver the amount required.

Therefore, a new institution should be set up to target interventions that will crowd-in the right type of capital to enable other types of finance to flow. To do so would require an analysis of the split of different types of capital required (e.g., fixed income-seeking or equity-seeking) that underlie the aggregate financing flows identified above ($1.8-2.3 trillion per year). The institution could then either explicitly provide the type of capital that is in short supply, or provide guarantees or other interventions to crowd-in that type of capital.

Lastly, the new institution could be solely focused on infrastructure, enabling it to build the right capacity and specialization to meet the infrastructure and sustainability challenge. Such specialization would be particularly important to develop the technical assistance capacity of this new institution over time. This would be crucial to support countries in developing a pipeline of investable projects. In doing so, it could, inter alia, serve as a vehicle that can reduce and absorb part of the up-front risk, finance key bottlenecks in the project pipeline, and generate sufficient knowledge and reputation to encourage investment flows in early stages and unlock investment opportunities in later stages. It could be a key convener and syndicator of programs in a way that closely involves the private sector and other public institutions such as national development banks and sovereign wealth funds.

This institution would therefore augment badly needed stable, predictable and appropriately scaled long-term supply of finance for infrastructure.

The new institution could be backed by a share of the growing pool of saving from emerging and developing countries, and thus simultaneously fund the infrastructure needed to boost growth and address global macroeconomic imbalances.

In parallel to this financing challenge, emerging and developing countries have a significant, and growing pool of savings. These savings are currently invested in low-return products from allegedly safe investments in developed countries. Higher returns opportunities exist where growth is and will be happening, in developing and emerging countries - this is where these funds should be flowing to.

The challenge, therefore, is to transform a share of the excess savings into stable, predictable and scaled finance to meet the capital challenges posed above, while still providing investors with safe high quality assets.

This reallocation of savings could be done in the context of tackling current macroeconomic imbalances. While initially the extra investment would come largely from the pool of extra savings worldwide, some would come from a recovery in growth rates and a better reallocation of savings. Future higher savings would be associated with the incremental growth from the investments in infrastructure.

Given the scale of the gap, a broad based effort is warranted to revamp global, regional and national institutions. A new development bank for infrastructure and sustainable development can play an important direct and catalytic role in this effort.

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