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Working Paper

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Discussion Paper, No. 18/2018

Provided in Cooperation with:
German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE), Bonn

Suggested Citation: Griffith-Jones, Stephany; Leistner, Samuel (2018) : Mobilising capital for sustainable infrastructure: the cases of AIIB and NDB, Discussion Paper, No. 18/2018, ISBN 978-3-96021-074-0, Deutsches Institut für Entwicklungspolitik (DIE), Bonn, http://dx.doi.org/10.23661/dp18.2018

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Deutsches Institut für Entwicklungspolitik

German Development Institute

Discussion Paper 18/2018

Mobilising Capital for Sustainable Infrastructure: The Cases of the AIIB and the NDB

Stephany Griffith-Jones
Samuel Leistner

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Discussion Paper / Deutsches Institut für Entwicklungspolitik
ISSN 1860-0441 / ISSN (Online) 2512-8698

Die deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über http://dnb.d-nb.de abrufbar.

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available in the Internet at http://dnb.d-nb.de.

ISBN 978-3-96021-074-0 (printed edition)

DOI:10.23661/dp18.2018

Printed on eco-friendly, certified paper

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Published with financial support from the Federal Ministry for Economic Cooperation and Development (BMZ)

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Acknowledgments

This discussion paper was written for the German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE) in Bonn. We wish to warmly thank the institute for commissioning this paper and Kathrin Berensmann for very stimulating discussions. We are very grateful to Peter Wolff for many insightful discussions and suggestions as well as for his valuable participation in several of the interviews held in Luxembourg and Washington, DC. We wish to thank all the interviewees, listed in the Appendix, for their valuable information and insights provided during interviews and after, as well as the three referees for excellent comments.

June 2018 Stephany Griffith-Jones and Samuel Leistner

Contents

Abbreviations

ADB	Asian Development Bank
AIIB	Asian Infrastructure Investment Bank
BRICS	Brazil, Russia, India, China and South Africa
CBA	cost-benefit analysis
DFI	development finance institution
EBRD	European Bank for Reconstruction and Development
EDB	Eurasian Development Bank
EIB	European Investment Bank
GEEREF	Global Energy Efficiency and Renewable Energy Fund
HKMA	Hong Kong Monetary Authority
IFC	International Finance Corporation
LIC	lower-income country
MCPP	Managed Co-Lending Portfolio Programme
MDB	multilateral development bank
MW	megawatt
NDB	New Development Bank
OECD	Organisation for Economic Co-operation and Development
SDG	Sustainable Development Goal
Sida	Swedish International Development Cooperation Agency
SPV	Special Purpose Vehicle
TANAP	Trans Anatolian Natural Gas Pipeline Project
tCO2e	tonnes of carbon dioxide equivalent

Executive summary

This discussion paper examines how private capital can be mobilised for sustainable infrastructure, with particular reference to the newly created Asia Infrastructure Investment Bank (AIIB) and the New Development Bank (NDB), also known as the BRICS Bank. These banks are an important addition to the development finance architecture.

The paper builds on the experiences of the European Investment Bank (EIB) – as well as multilateral and other regional and national development banks more generally – to draw possible lessons that may be relevant to these two new development banks.

This discussion paper specifically reviews different instruments for mobilising private capital that complements these development banks' loans to finance environmentally sustainable infrastructure. This paper draws not only on the literature and previous experiences of the authors, but also on a large series of in-depth, high-level interviews carried out in Luxembourg, Washington, DC, London and (by phone) Paris.

The total amount of investment needed by 2030 to close the global infrastructure gap is estimated to reach $86 trillion; further additional investments will be needed to meet the two-degree climate goal of the Paris Agreement. Most of the investments will be required in emerging and developing countries. Sustainable infrastructure is often more capital-intensive, which makes (low-cost) finance – such as that which can be provided or facilitated by development banks – even more important.

Although sustainable infrastructure might currently not always be the most cost-efficient option in many countries, it is important to make the correct decisions towards sustainable infrastructure right now because investments will be locked in for the long term; this is true, in particular, for renewable energy projects with their long lifecycles.

Although the costs of renewables are falling sharply, they remain more expensive than fossil fuel alternatives in many situations. They also raise issues of storage, grid stability and transmission that do not apply to fossil fuels. In this regard, it is essential that low-income countries, which are historically not responsible for global climate change, do not bear the costs of subsidising renewable-energy use. These costs must be covered by external sources. Nevertheless, it can be expected that the levelised costs of renewable energy will become competitive to those of fossil fuels in more and more countries.

A very important role in financing such investments in sustainable infrastructure is – and will increasingly be – played by multilateral development banks, including the newly created AIIB and NDB. The large scope of the AIIB and the NDB implies a valuable addition to development finance in that area. The AIIB and the NDB will matter not only because of their huge capitalisation but also because of their openness to funding sustainable infrastructure; thus, the NDB has committed to devoting two-thirds of its lending to sustainable infrastructure. Moreover, these banks are open to innovative financial instruments such as green bonds and carbon shadow pricing. The NDB has already issued a green bond, and it can be expected that the issuances will be expanded.

The recommended initial key financial instruments for the new development banks are, however, "plain vanilla" loans, similar to what the European Investment Bank (EIB) and

the World Bank have offered in the past. Simple instruments may be better in an initial phase, especially for well-capitalised banks such as the AIIB. This implies that the urgency of leveraging vast amounts of additional resources for its operations is not so great as for other development banks, at least in the short-term. Furthermore, these simpler instruments are easier and quicker to implement, have lower transaction costs and carry fewer risks for the development bank.

Although there is a strong case for the new development banks to focus initially on traditional instruments, development banks generally should use a range of financial instruments to mobilise private capital. Blended finance and giving guarantees to de-risk investments helps to make sustainable long-term infrastructure investments attractive for private investment.

The levelised costs of renewable energy are rapidly coming down, in comparison to fossil fuels, **making renewable energy more commercially viable, which is extremely positive**. This may help attract additional private investment on a significant scale; however, this is not the case everywhere, nor is it true for all renewables. Furthermore, given the uncertainty about the introduction of this technology – which only increases if the investment is in countries seen as having less transparent regulatory frameworks – private capital may be unwilling to invest in renewables, even if they are commercially attractive.

To help ensure and facilitate that enough private investment in renewables, energy efficiency and other sustainable infrastructure is made, effective incentives and a clear mandate are needed for all development banks, including the AIIB and the NDB.

Both approaches have been pioneered by the EIB in ways that can be of interest to the new banks – the AIIB and the NDB – as well as existing development banks. These include evaluating projects with a shadow carbon price. This shadow carbon price should be high enough to provide sufficient incentives. The Carbon Pricing Leadership Coalition, chaired by Joseph Stiglitz and Nicholas Stern, recommends a price for carbon that is consistent with achieving the Paris temperature target: at least $40-$80/tCO2e (tonnes of carbon dioxide equivalent) by 2020 and $50-$100/tCO2e by 2030, provided that a supportive policy environment is in place.

However, if this is not sufficient to discourage clearly undesirable fossil fuel, carbon-intensive investments, the price may be complemented by stipulations to avoid fossil fuel projects or to put a clear limit on these, with possible exceptions for very poor countries. It is important to stress that poor people in poor countries should pay no more for their energy than the least-cost, locally available alternative. Adopting a high shadow carbon price may result in expensive energy options being funded. To avoid having local people pay for this, costs above the *least-cost* alternatives should be covered in the project. Development banks should partner with climate finance institutions, such as the Green Climate Fund, with the latter providing the grants that can make the cost of energy cheaper. Also, where there are no alternative sources for electricity or heating, it seems clearly desirable that poor people use energy sources with higher levels of carbon emissions.

In cases where selected projects are not sufficiently commercially attractive to the private sector for investment, development banks can aim to *transform* them in the following ways

by: 1) increasing their attractiveness to commercial co-investors or lenders by boosting returns (e.g. with blended finance), or 2) mitigating risks (e.g. providing co-financing or investment, with guarantees against defined risks or first losses).

A range of more specialised financial instruments are available for the latter purpose and could be applied by the AIIB and the NDB. Some examples, which we study in detail in this paper, are the International Finance Corporation's (IFC) Managed Co-Lending Portfolio Programme (IFC MCPP) and the EIB's Global Energy Efficiency and Renewable Energy Fund (GEEREF).

The MCPP has already attracted significant amounts of investment from large insurance companies to co-finance a portfolio of IFC projects, both in the construction phase as well as in later phases, in a variety of emerging and developing countries. These institutional investors have been attracted by the idea of co-investing with the IFC as well as its broad investment expertise in infrastructure across many countries; by the diversification of the portfolio; and also by the implicit guarantee given by a first-loss provision, reaching 10 per cent of total loans, which are partly funded by the Swedish International Development Cooperation Agency. The latter aspect may require further analysis, as it does imply some fairly large contingent liabilities for the IFC. However, in other aspects, this seems to be a very attractive instrument, especially as it helps catalyse investment from institutional investors, which was the "holy grail" of development finance experts. This is because these institutional investors have the long-term assets needed to fund long-term investment in sustainable energy, especially those projects that only become profitable over the long term.

Another example is GEEREF, which is also very innovative, as it funds greenfield investments in small and medium-sized projects in emerging and especially low-income countries. GEEREF provides equity to specialist private equity funds. These funds, in turn, invest in a broad mix of small to medium-sized projects (through equity and mezzanine instruments) in renewable energy – such as solar, biomass and wind farms – and energy-efficiency sectors focussing on the riskier, early-stage development phases. The key idea is to help create a market for renewable-energy and energy-efficiency greenfield investments in poorer countries, as well as to have an impact on environmental and social standards. GEEREF has a "fund of funds" approach, and has a targeted multiplier (up to 50) in terms of the total private capital it intends to attract. GEEREF is broadly seen as being very successful, as is shown by the fact that donors are providing capital for a larger GEEREF NEXT initiative. One problem has been the high transaction costs of raising private capital. However, it can be expected that the demonstration effect of GEEREF and its projects on the ground will make the task easier for GEEREF NEXT and similar funds in other institutions. Indeed, GEEREF is one very interesting example of a fund or facility that pools development bank funds and commercial finance.

Besides the use of innovative financial instruments to mobilise capital for sustainable infrastructure, it is important that large development banks use their influence to make a case to improve Basel III and Solvency II to keep them from discouraging the financing of long-term investments, as is happening now. Furthermore, with regards to regulatory incentives, it seems important for large development banks to discuss with financial regulators about ways to maintain financial stability to help minimise the risks arising from

climate change – risks that are not only negative for the world at large, but also pose major risks to financial stability.

1 Introduction

This paper examines how private capital can be mobilised for environmentally sustainable infrastructure, with particular reference to the newly created Asian Infrastructure Investment Bank (AIIB) and the New Development Bank (NDB), also known as the BRICS Bank. These banks are an important addition to the development finance architecture.

In this sense, it is important to highlight that these new institutions have a major focus on infrastructure, and in particular on sustainable infrastructure; for example, the NDB is planning in the next five years to devote two-thirds of its lending to sustainable infrastructure (NDB [New Development Bank], 2017a). The AIIB and the NDB are therefore potentially very valuable institutions for promoting sustainable investment. This is true in general, but also in the context of the large-scale investment that especially the AIIB would offer in the context of the One Belt One Road Initiative.

The purpose of this paper is to assess the funding instruments of the AIIB and the NDB for providing support for sustainable infrastructure. It builds on the experiences of the European Investment Bank (EIB) – as well as multilateral and other regional and national development banks more generally – to draw possible lessons that may be relevant to these two new development banks. The research for this paper draws not just on the literature and previous experiences of the authors, but also on a large series of in-depth, high-level interviews carried out in Luxembourg, Washington, DC, London and (by phone) Paris between October and December 2017. (For a list of interviewees, see the Appendix).

Section 2 offers an overview of the global sustainable infrastructure gap and makes a case that one of the key roles of development banks should be to both fund investment in sustainable infrastructure as well as facilitate private capital to be invested in sustainable infrastructure.

Section 3 describes the different instruments that development banks use to fulfil their role of financing renewable energy as well as the desirable features of such instruments. We mainly look at the experiences of the EIB, but also, where relevant, at the instruments of other institutions, specifically the Co-Lending Portfolio Programme (MCPP), which is designed and operated by the International Finance Corporation (IFC). The programme is seen as being a potentially pioneering instrument by several observers, including senior officials at the AIIB. After a broad introduction, which emphasises the importance of "plain vanilla" instruments – such as lending, dominant instruments in existing development banks as well as broad actions development banks can take to encourage private investment in renewable infrastructure – we analyse instruments that facilitate the choice of less carbon-intensive projects via the use of shadow carbon pricing for project evaluation, which is an area where the EIB has been pioneering. We then study two instruments in-depth that reduce risks for private investors: the mentioned MCPP at the IFC, and the Global Energy Efficiency and Renewable Energy Fund (GEEREF) at the EIB. We draw potential lessons, including for the AIIB and the NDB.

Sections 4 and 5 provide detailed analyses of the AIIB and the NDB, including the instruments they use and the projects they have financed. As these banks are new and there is relatively little research, we provide some broader background, such as their memberships, mandates, etc.

Section 6 concludes and provides policy recommendations.

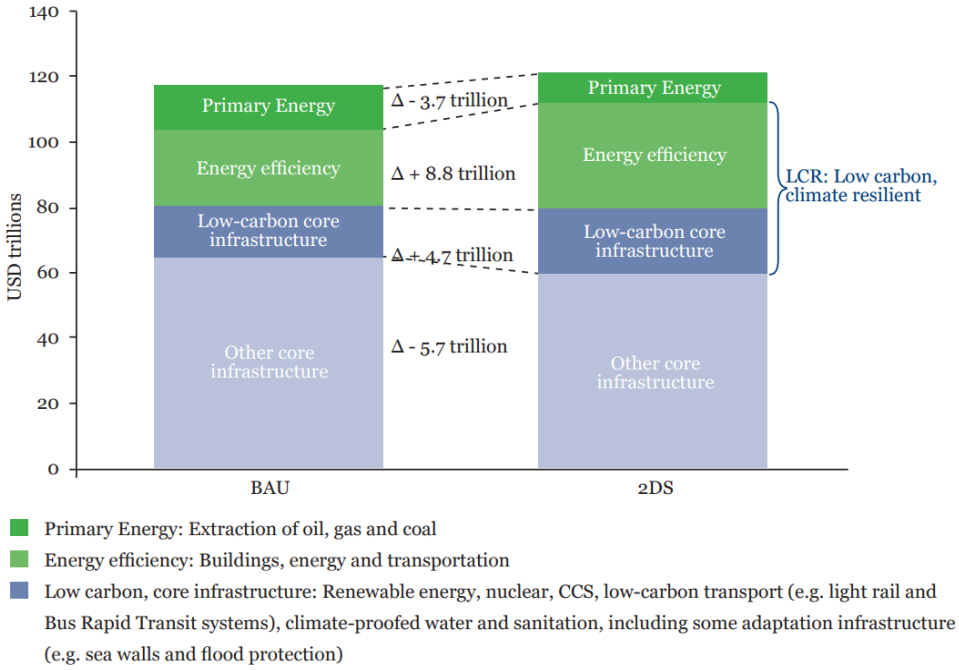
2 The sustainable infrastructure gap and the role of green energy

A huge mismatch exists between current and future infrastructure demand and what is being invested. This global infrastructure gap poses a threat to future growth and the success of the Sustainable Development Goals (SDGs). The United Nations Conference on Trade and Development stated in its 2014 World Investment Report that global annual spending on economic infrastructure is lower than $1 trillion and will need to rise to between $1.6 and $2.5 trillion annually over the period 2015-2030 (United Nations Conference on Trade and Development, 2014). Bhattacharya, Meltzer, Oppenheim, Qureshi and Stern (2016) see the scenario as being even more drastic and estimate that $75-$86 trillion would need to be invested in infrastructure globally over the next 15 years. Most of the investment will be required in emerging markets and developing countries, with the highest growth rate in demand being projected for Africa. Asia continues to account for the largest share of infrastructure demand. However, they also estimated higher current total investment levels in core infrastructure of $3.4 trillion in 2015.

To meet the SDGs and the goals of the Paris Agreement, most of this infrastructure will need to be sustainable infrastructure. Sustainable infrastructure comprises infrastructure that is socially, economically and environmentally sustainable (Bhattacharya et al., 2016). Moreover, sustainable infrastructure also helps to improve resilience to deal with natural disasters and the impacts of climate change. Nevertheless, sustainability will depend on the local context, and a positive short-term improvement might not be the most sustainable solution in the long-term (New Climate Economy, 2016). Renewable-energy investments are key to closing the global sustainable infrastructure gap: $13.5 trillion is expected to be invested overall between 2015 and 2030 in low-carbon infrastructure (Bhattacharya et al., 2016). To support this goal, the expert commission of the New Climate Economy recommends that multilateral, bilateral and national development banks and other development finance institutions (DFIs) double their investments in sustainable infrastructure (New Climate Economy, 2016).

In addition, meeting the two-degree climate goal of the Paris Agreement would include an increase of $4.7 trillion in low-carbon, core infrastructure by 2030 and also additional investments of $8.8 trillion in energy efficiency. However, some of this sustainable infrastructure will replace non-sustainable infrastructure, as shown in Figure 1, thus lowering the costs when moving from a business as usual (BAU) scenario towards the two-degree path (2DS). Going the two-degree path would lead to a $3.7 trillion decrease in investment in primary energy and a $5.7 trillion decrease in other core infrastructure. The total additional cost required to meet the two-degree goal is therefore $4.1 trillion by 2030 (Meltzer, 2016).

Figure 1: Cumulative infrastructure investment needs, 2015-2030

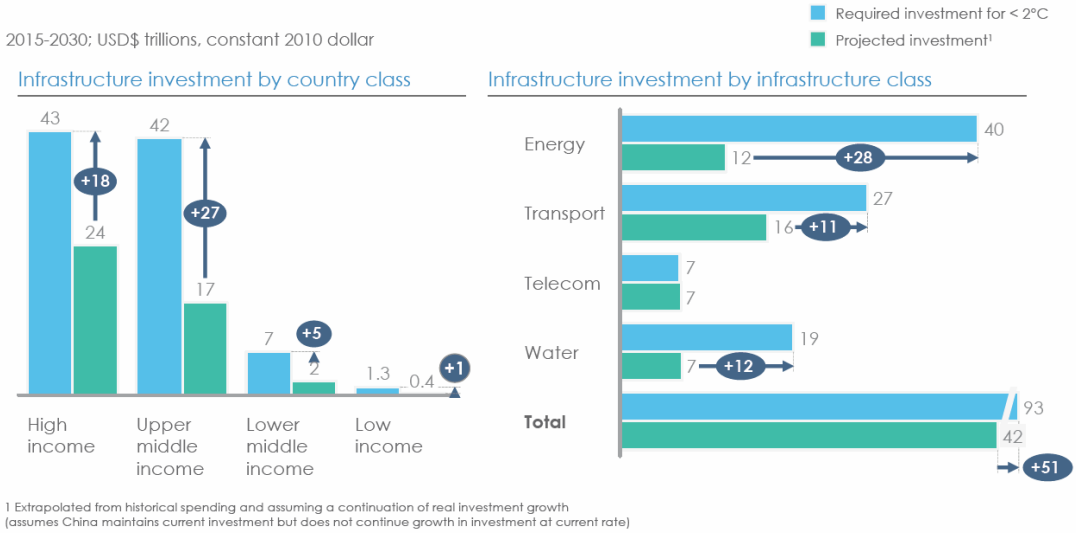


Primary Energy: Extraction of oil, gas and coal
Energy efficiency: Buildings, energy and transportation
Low carbon, core infrastructure: Renewable energy, nuclear, CCS, low-carbon transport (e.g. light rail and Bus Rapid Transit systems), climate-proofed water and sanitation, including some adaptation infrastructure (e.g. sea walls and flood protection)

Source: Meltzer (2016)

Figure 2 depicts a separation of the needs by country group and infrastructure class (Energy Transitions Commission, 2017; McKinsey, 2016). The majority of investments need to be made in non-high-income countries. Furthermore, high-income countries also have the lowest relative sustainable infrastructure investment gap. More than 50 per cent of the investment needed to reach the two-degree goals is already being projected. Regarding the infrastructure classes, the biggest gap is in energy with $23 trillion, followed by water and transport. Only telecommunication has sufficient projected investments to reach the two-degree goal.

Figure 2: Energy investment needs by country and infrastructure class



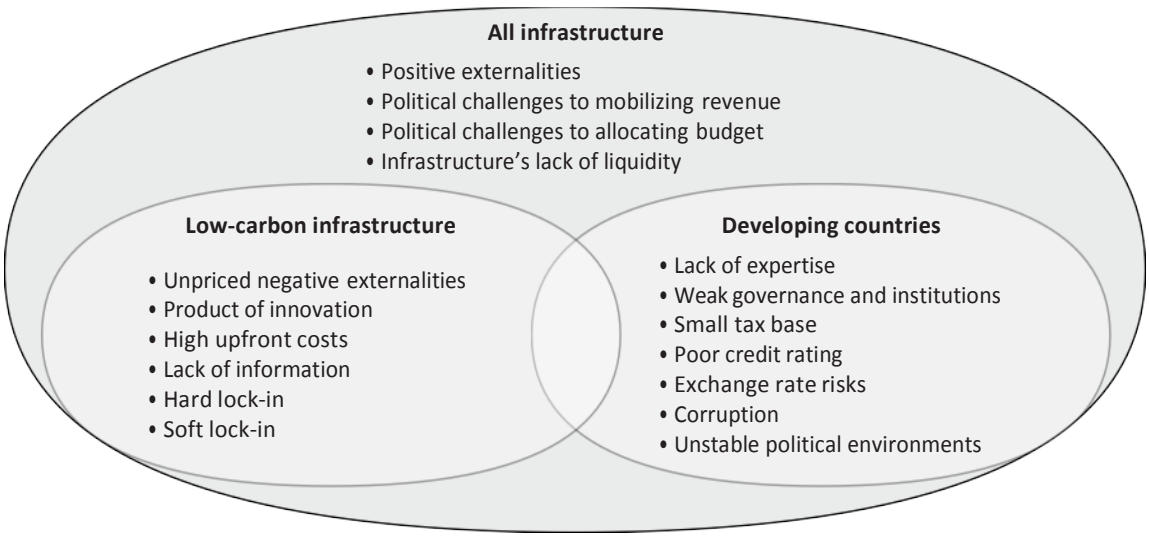
1 Extrapolated from historical spending and assuming a continuation of real investment growth (assumes China maintains current investment but does not continue growth in investment at current rate)

Source: Energy Transitions Commission (2017; based on McKinsey, 2016)

There are several reasons why not enough investments are being made in sustainable infrastructure to reach the two-degree goal, and also why there is not a sufficient number of overall infrastructure investments. Sustainable infrastructure is often more capital-intensive, which makes (low-cost) finance – such as that which can be provided or facilitated by development banks – even more important (Bhattacharya et al., 2016; New Climate Economy, 2016). There have been some long-established problems in attracting private finance for infrastructure investments. Furthermore, there is the traditional economic problem that private markets have failed to provide sufficient large-scale infrastructure investments, for example because they are unwilling to fund long maturities, especially at large scale. The state therefore often needs to provide infrastructure by itself, establish public–private partnerships or incentivise private investments in various ways. Developing countries with low levels of expertise – in some cases unstable political environments and weak institutions – pose even higher barriers for attracting private finance for infrastructure. This is in addition to problems in accessing international capital markets.

In addition to these problems, there are further barriers, which are summarised in Figure 3. One problem is that, for example, renewable-energy investments have long lifecycles but high upfront costs. This makes them an extremely difficult type of infrastructure for developing countries to fund, particularly given the high financing costs they often have to pay. Often the negative externalities of traditional infrastructure, which are not reflected in market prices, are not addressed in budget allocations and project planning, which makes low-carbon infrastructure even less competitive; these externalities are particularly hard to address in poorer countries with limited fiscal space. Also, existing infrastructure has strong lobbies, thereby obstructing the shift from high-carbon to low-carbon infrastructure (Granoff, Hogarth, & Miller, 2016).

Figure 3: Nested carriers to low-carbon infrastructure



Source: Granoff et al. (2016)

Although the costs of renewables are falling sharply (see below), they remain more expensive than fossil fuel alternatives in many situations. They also raise issues of storage, grid stability and transmission that do not apply to fossil fuels. Therefore, if we want lower-income countries (LICs) to choose renewable-energy options over fossil fuels, this may

come at some cost. In this regard, it is essential that LICs, which are historically not responsible for global climate change, do not bear the costs of subsidising renewable-energy use. These costs must be covered by external sources, such as special climate funds, aid, etc. (Griffith-Jones, Ocampo, & Spratt, 2012).

As international, regional, bilateral and national providers of finance, development banks have a particularly large role to play, both in co-financing public investment as well as lending to the private sector and attracting additional private flows. It is encouraging that international infrastructure finance, in particular from multilateral development banks, has increased a great deal in the 21st century.

It is important to make the correct decisions right now towards sustainable infrastructure because investments will be locked in for the long term; this is true, in particular, for renewable energy projects with their long lifecycles. Granoff et al. (2016) explain that one barrier to low-carbon infrastructure is that this lock-in has happened already for high-carbon infrastructure. This creates a hard lock-in – meaning that retrofits are either expensive or impossible – and a soft lock-in of institutions, technical knowledge and lobbies. A good European example for the consequences of this is the Spanish energy market, in which former long-term investments in non-renewable-energy power plants block the further success of solar energy, which is often cheaper and more efficient.

3 Development bank instruments for encouraging sustainable infrastructure

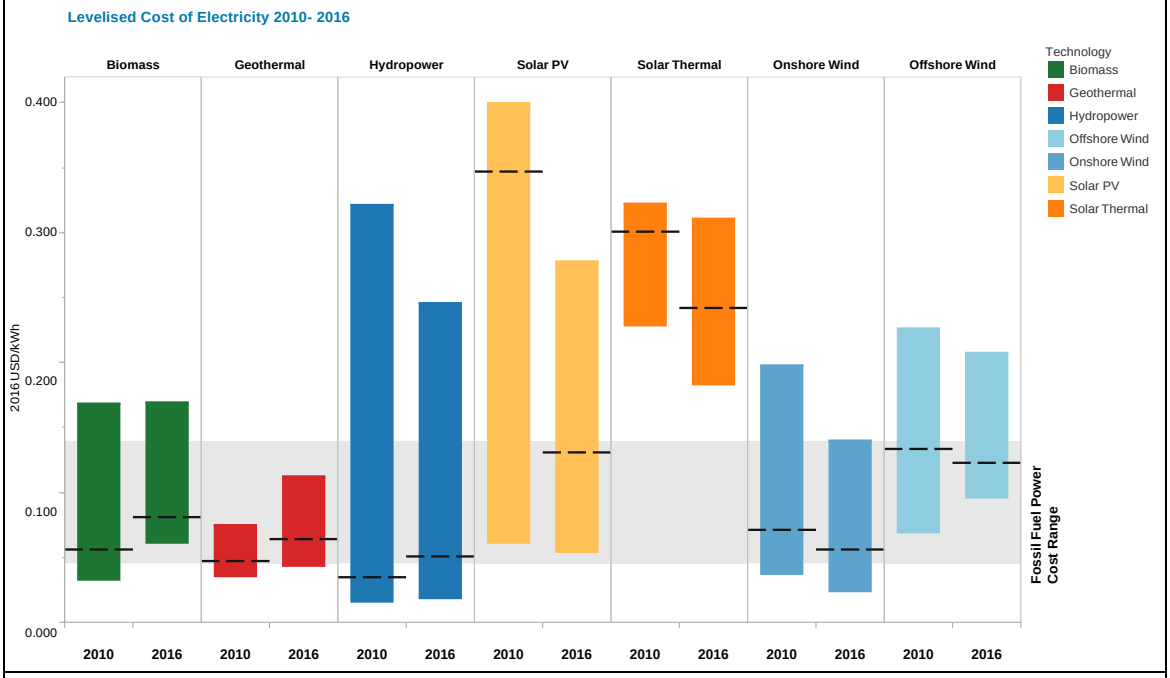
Introduction

One of the clear aims of development banks should be to help finance sustainable infrastructure. This implies meeting two goals at the same time: 1) facilitate and support inclusive development, as there is ample evidence (see e.g. in Bhattacharya et al., 2016) that infrastructure is an essential pre-condition for growth and development; if properly distributed, infrastructure can also provide crucial access to economic activity and to key services such as electricity to poorer regions and people; 2) meet the limits of global warming agreed at COP 21 (Paris) and COP 23 (Bonn) – it is essential that this new infrastructure is as sustainable as possible to minimise the effects of climate change. This is a crucial challenge because, in the next decade, there will be much investment made in infrastructure. It is important that, during this period, the new investments are locked in (with long-term effects) and are as sustainable as possible.

The levelised costs of renewable energy are rapidly coming down, in comparison to fossil fuels, **making renewable energy more commercially viable, which is extremely positive**. This may also help attract additional private investment on a significant scale; however, this is not the case everywhere, nor is it true for all renewables. As seen in Figure 4, the levelised costs of solar PV and hydropower vary greatly, which can mostly be explained due to geographical differences. It is therefore important to also support technologies that have a lower level of maturity but the potential to perform well in regions where existing technologies are expensive. Moreover, although the costs for wind energy are falling, it must also be considered that wind is traditionally a technology that relies on large-scale

projects with high costs, whereas solar renewable energy systems can often be installed in smaller capacities.

Figure 4: Levelised costs of energy, 2010-2016



Source: IRENA [International Renewable Energy Agency] (2017a)

Furthermore, given the uncertainty about the introduction of this technology – uncertainty that only increases if the investment is made in countries seen as having less transparent regulatory frameworks – private-capital investors may be unwilling to invest in renewables, even if they are commercially attractive.

To help ensure and facilitate that enough private investment in renewables, energy efficiency and other sustainable infrastructure is made, effective incentives and a clear mandate are needed for all development banks, including the AIIB and the NDB.

Both approaches have been pioneered by the EIB in ways that could be of interest to the new banks – the AIIB and the NDB – as well as existing development banks. These include evaluating projects with a shadow carbon price (see also Stiglitz Stern report, Carbon Pricing Leadership Coalition, 2017). This shadow carbon price should be high enough to provide sufficient incentives. However, if this is not sufficient to discourage clearly undesirable fossil fuel, carbon-intensive investments, the price may be complemented with stipulations that fossil fuel projects be avoided or that clear limits are placed on these, with possible exceptions for very poor countries. The pioneering experiences of the EIB are discussed in depth in Section A below.

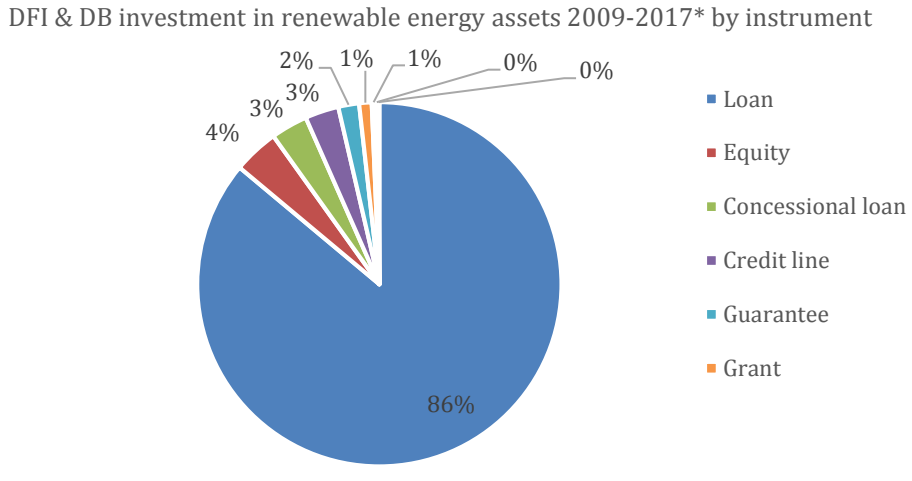
Before doing so, it is important to stress that poor people in poor countries should pay no more for their energy than the least-cost, locally available alternative. Adopting a high shadow carbon price may result in expensive energy options being funded. To avoid having local people paying for this, costs above the *least-cost* alternatives should be covered in the project. Rather than meet these costs directly, development banks should partner with climate finance

institutions, such as the Green Climate Fund, with the latter providing the grants that can make the cost of energy cheaper. Also, where there are no alternative sources for electricity or heating, it seems clearly desirable that poor people use energy sources with higher levels of carbon emissions.

In cases where selected projects are not sufficiently commercially attractive to the private sector for investment, development banks can aim to *transform* them in the following ways by: 1) increasing their attractiveness to commercial co-investors or lenders through boosting returns (e.g. with blended finance), or 2) mitigating risks (e.g. providing co-financing or investment, with guarantees against defined risks or first losses).

In Sections B and C below, we discuss (based mainly on interviews) two instruments seen as being very successful. The first is the IFC's MCPP, where institutional investors, specifically insurance companies, have started co-investing with the IFC in a portfolio of IFC projects on a large scale. This is in response to a major challenge, which is that there has been very limited involvement by institutional investors in infrastructure, including sustainable infrastructure. This absence is notable, given that the largest source of private capital globally – with approximately $110 trillion in assets under management – is in the hands of institutional investors (see Bhattacharya et al., 2016). The current environment of very low interest rates in developed economies should be favourable enough to encourage a search for higher returns in long-term investment, such as sustainable infrastructure. The second instrument analysed is the EIB's GEEREF, which is a "fund of funds" with public-sector capital complementing private capital while investing exclusively in renewable-energy and energy-efficiency greenfield investments in mainly poorer countries. Additional instruments can include green bonds, which were pioneered by development banks, starting with the EIB (which was the largest development bank to issue green bonds), but also including the World Bank, among others.

Figure 5: Public finance institutions' investment by instrument



Source: Compiled by authors based on data from IRENA (2017b)

Before looking in depth at the abovementioned instruments, a couple of caveats need to be highlighted. The first one is that, as shown in Figure 5 above, with regards to development bank and DFI financing of investments in renewable-energy infrastructure, 89 per cent is

made through loans (86 per cent) and credit lines (3 per cent), adding up to 89 per cent of the total. This means that loans from these institutions – most of which are plain vanilla – are by far the dominant modality. The data cover the major multilateral and bilateral development banks, including the World Bank, the Asian Development Bank and the African Development Bank but also major DFIs such as the Overseas Private Investment Corporation.

An important criterion for choosing the mix of instruments is that they should facilitate a rapid and significant financing of infrastructure. The president of the AIIB has rightly emphasised the need for speed in arranging funding. Secondly, the AIIB has a fairly large level of capital, so the urgency for leveraging vast amounts of additional resources for its operations is not as great as for other development banks, at least in the short-term (BNEF [Bloomberg New Energy Finance], 2017). Thirdly, since the capital of multilateral development banks (MDBs) such as the AIIB and the NDB originates from the savings of shareholder governments (and therefore of their citizens), unnecessary financial risks (and therefore excessive public contingent liabilities) should not be created. Though this may somewhat restrict the capacity of the AIIB to leverage its capital by very large amounts in the short term, it will reduce future risks to its capital and profitability.

Rather than excel in "financial engineering" – as the private financial sector has, which has often resulted in the creation of excessive systemic risk, sometimes leading to developmentally costly financial crises – new MDBs such as the AIIB and the NDB should excel in real engineering to support countries and regions in designing and developing good infrastructure projects. Indeed, especially in the earlier phases, this is exactly what the World Bank – and especially the EIB – has done. To fulfil these criteria, **simple instruments, such as plain vanilla loans, may be the most appropriate, especially for a new MDB just beginning operations**.

To achieve greater leverage over time, other instruments such as guarantees to private investors and lenders need to be developed to complement loan instruments (see also Griffith-Jones & Kollatz, 2015). However, there is a strong case for the predominance of simple instruments such as long-term lending that is co-financed by private lending and equity. Alternative instruments that potentially can provide more leverage are complicated to arrange, and they may force public development banks such as the AIIB to take excessive risks. Finally, transactional costs tend to be higher with more complex instruments (as discussed below), so it seems clear that it is preferable to use them for larger projects or carefully packaged ones.

A second caveat is that development banks, both new and old, have complementary ways of encouraging private investment, aside from the types of instruments described above and below. One that came up frequently in the interviews carried out and in the literature is the issue of regulation. In the wake of the so-called global financial crisis of 2007-2009, many financial regulations were rightly tightened, with the correct aim of improving financial stability and reducing systemic risk. One unintended consequence has been that maturity mismatches have been discouraged, for example in the banking sector, via Basel III; this creates a disincentive for private banks to lend for the long term, including for sustainable infrastructure.

Furthermore, some regulations, for example Solvency II, excessively discourage long-term investments, including in sustainable infrastructure by institutional investors, such as insurance companies (Persaud, 2015). Thus, Persaud (2015) argues that the main problem with Solvency II is that the riskiness of the assets of a life insurer or pension fund with liabilities that will not materialise for 10 or sometimes 20 years is not well-measured by the amount by which prices may fall during the next year, which is the criteria used by Solvency II. Solvency II fails to take account of the fact that institutions with different liabilities have different capacities for absorbing different risks, and that it is the exploitation of these differences that creates systemic resilience. An alternative approach that is more attuned to the risk that a life insurer might fail to meet its obligations when they come due (shortfall risk) and less focussed on the short-term volatility of asset prices would correct this problem. That type of proposal could facilitate greater investment from insurance companies in sustainable infrastructure. It would seem important for development banks such as the AIIB, the NDB, the World Bank and the EIB to make the case for necessary changes in financial regulation, which by continuing to safeguard financial stability, facilitate higher levels of investment in sustainable infrastructure.

On the other hand, there is insufficient emphasis in financial regulation of the need to encourage financing that supports investment in sustainable economic activities, and to discourage investment in high-carbon investments; for example, investment in the latter may lead to "stranded assets" in the future, generating future risks. Some important steps are currently being taken by the European Commission to improve this regulation by focussing on reliable information, sustainability and risk management as well as long-termism in governance (European Commission, 2018). It seems important for large development banks such as the EIB, the World Bank and the new development banks (the AIIB and the NDB) to discuss with financial regulators about ways to minimise the risks arising from climate change, which are not only negative for the world at large, but could also pose major risks to financial stability. Regulatory measures could be positive (reducing weighting, e.g. of bank capital) for instruments that are environmentally friendly, for example green bonds, or for lending for sustainable energy projects more generally; they could also be negative by discouraging lending or investing in high-carbon activities, again through higher capital requirements for the latter.

A second important complementary way in which MDBs, both old and new, encourage private investment is by supporting the development of local capital markets in general, and specifically the development of local currency instruments. The former will help mobilise national savings via local actors; national development banks can collaborate in these tasks. The latter – developing local currency instruments – will reduce currency mismatches and could also tend to favour local investors (if these are dominant in the local currency market) by reducing the risks posed by impatient foreign capital investors.

A third important complementary way in which MDBs, both old and new, can encourage private investment is to address the problem of "not enough shovel-ready projects available", a problem which tends to be more serious in poorer countries. This problem can be tackled at several levels – both financial and non-financial – by providing expertise.

A first approach is to help fund facilities that provide financing for project preparation; the AIIB has, for example, created such a facility, which is to be welcomed as being extremely valuable (interview material). This is particularly important in the early stages of spatial

planning and project planning. A second, more ambitious approach is for these MDBs to help develop – including at a sub-national level, for example big cities – major, ambitious projects for greening the economy, for example ambitious green public transport. Working with local public and private actors, MDBs have the experience, the resources and the convening power to play an even more dynamic role than they have in the past in helping to create and bring to fruition such major initiatives.

A final general point to make is that it is important to distinguish between the nature of projects and the different infrastructure phases, especially the construction and operation of projects. A very important distinction is between the construction of greenfield projects (more risky phase) and the operation of existing projects (less risky). Institutional investors, for example, are less likely to assume the risks of making greenfield investments – risks that are more likely to be taken by developers and banks. However, institutional investors are more likely to invest in the operation of recently built or existing projects. Naturally, the level of likely returns and the risks (and whether some of these are guaranteed or not, for example by development banks) are major determinants for the decision by private actors to commit resources.

We now turn to the instruments, which are analysed in depth: use of carbon pricing for project evaluation, the MCPP programme and GEEREF. The first instrument transfers the returns to investors by introducing a shadow price of carbon. The other two instruments below modify the risk to investors, for example guarantees and co-financing.

A. Use of carbon pricing for project evaluation

As regards carbon pricing, we start by looking briefly at the main conclusions of the Commission chaired by Joseph Stiglitz and Nicholas Stern on shadow carbon pricing (Carbon Pricing Leadership Coalition, 2017) and then focus mainly on the experiences of the EIB, which pioneered shadow carbon pricing starting in the mid-1990s, thereby offering valuable precedents and lessons. Other development banks, such as the World Bank, have also reportedly started introducing shadow carbon prices, but their experiences are much more recent.

Shadow carbon pricing's role in the Commission chaired by Stiglitz and Stern

The purpose of this Commission was stated as follows:

> [...] to explore explicit carbon-pricing options and levels that would induce the change in behaviours – particularly in those driving the investments in infrastructure, technology, and equipment – needed to deliver on the temperature objective of the Paris Agreement, in a way that fosters economic growth and development, as expressed in the Sustainable Development Goals (SDGs).

The report argues that

> **[a] well-designed carbon price is an indispensable part of a strategy for reducing emissions in an efficient way.** Carbon prices are intended to incentivize the changes needed in investment, production, and consumption patterns, and to induce the kind of technological progress that can bring down future abatement costs. There are different

> ways to introduce a carbon price. […] Carbon pricing can (also) be implemented by embedding notional prices in, among other things, financial instruments and incentives that foster low-carbon programs and projects. […] Explicit carbon pricing can be usefully complemented by shadow pricing in public sector activities and internal pricing activities in firms.

Nevertheless, this report acknowledges that shadow carbon pricing is not a silver bullet. By itself, it cannot deal with mitigating climate change by emphasising the fact that achieving the Paris objectives requires all countries to implement climate policy packages. These packages can include policies that complement carbon pricing and tackle market failures other than the greenhouse gas externality. These failures are related to

> knowledge spill-overs, learning and R&D, information, capital markets, networks, and un-priced co-benefits of climate action (including reducing pollution and protecting ecosystems). The design of these policies will thus vary and always have to take into account national and local circumstances.

This Commission concludes that the **explicit carbon-price level consistent with achieving the Paris temperature target is at least $40-$80/tCO2e (tonnes of carbon dioxide equivalent) by 2020 and $50-$100/tCO**2 **by 2030**, provided that a supportive policy environment is in place.

It is encouraging that the shadow carbon prices estimated by the Stiglitz and Stern Commission are not very different from those the EIB is already applying, which are for low, central and high price scenarios in 2017 (in 2015 euros): €16/tCO2e ($19/tCO2e); €37/tCO2e ($44/tCO2e); and €62/tCO2e ($73/tCO2e). Furthermore, the prices will increase significantly by 2030. The value of the shadow carbon price currently being applied by the EIB and projected for future years is shown in Table 1 below.

It is also relatively similar to the shadow price that the World Bank has started to apply more recently, beginning at $30/tCO2e in 2015 and increasing to $80/tCO2e by 2050 (World Bank, 2017).

EIB experiences with using shadow carbon pricing

The EIB was the first development bank to use shadow carbon pricing, starting already in the mid 1990s. Therefore, its experiences are especially valuable in offering positive and negative lessons for newer institutions such as the AIIB and the NDB, but also to other regional – and possibly national – development banks.

EIB evaluations of projects, which were based on cost-benefit analysis (CBA), were enshrined in EIB statutes (interview material). Indeed, the EIB has a very specific project mandate. It has been argued by EIB staff that there is a difference compared to other MDBs, which are more focussed on a broader development mandate. Apparently, as a result, CBA was not as fully mainstreamed in these other MDBs. Because "CBA is in the EIB's DNA", it became natural to integrate the shadow price of carbon into its cost-benefit analysis. Integrating the shadow cost of carbon relatively reduces the cost of renewables and penalises carbon-intensive technologies.

Furthermore, the EIB framework is especially relevant for the AIIB and the NDB as well as other development banks that are dedicated to financing infrastructure projects, including in the sustainable energy and transport sectors.

Two key questions arise: What is the right shadow carbon price to use? What does it mean in practice for project evaluations and especially the choice of projects to finance?

In the EIB, the energy and transport departments have used shadow carbon pricing since the mid-1990s. Different sectors had different prices. By 2007, the Board of the EIB approved the use of shadow carbon pricing for all sectors until 2030 (interview material). This was recently extended until 2050 as part of the EIB Climate Action Strategy.

The shadow value of carbon for the EIB consists of a central estimate for the damage associated with an emission in 2010 of €25/tCO2e, plus a high and low estimate of €40 and €10, respectively (all measured in 2006 constant euros). Reflecting a common finding that the marginal damage of emissions increases with greater atmospheric concentrations of carbon, annual "adders" are applied after 2010 – that is, an absolute increase in value per year (measured in constant 2006 prices). Hence an emission in 2030 under the central estimate equals 25 + (20 x 1) = €45 (in 2006 euros).

Table 1: Value of carbon in EIB appraisal (€/tCO2e)

	Value 2010 (€)	Annual adders 2011 to 2030
Central	25	1
High	40	2
Low	10	0.5

Source: European Investment Bank (2013)

As regards the second issue, how are these shadow prices used? What is the impact on projects chosen to be financed? In recent years, no new lignite projects have been started. In 2006, the last coal project funded by the EIB was approved, in Slovenia (interview material). More broadly, EIB policy has implied a major shift since mid-2000s towards renewable energy.

It is important to stress that, **even with a high price for carbon, some high-carbon activities became borderline profitable. So as not to invest in them, additional safeguards had to be introduced through an emission-performance standard (limit of emissions of grams per kilowatt hour).** Therefore, some borderline investments in high-carbon activities could only be blocked because of this internal regulatory restriction. This became more relevant when coal prices went down in the mid-2010s. This made the rehabilitation of coal mines in Germany, Poland and Holland profitable, even when including shadow market pricing. The safeguard just described was strict enough that coal became ineligible. Thus, the CBA was overlaid with an administrative restriction that had even more traction for the energy sector (interview material). It is interesting, however, that the EIB makes an exception for least-developed countries and islands with unconnected systems. Such exceptions seem right, especially if fossil fuel alternatives are much cheaper, there are no external (to the country) funds provided and/or there is no renewable alternative in a particular region or locality. Furthermore, it is important to note that there is always the

possibility that national policy banks will finance carbon-intensive projects if MDBs do not finance them.

Other sectors are reportedly more complex, such as transport (trains vs motorway). In those sectors, other factors are important, for example speed and the number of accidents. Therefore, they are relatively insensitive to the price of carbon. However, electric cars can change the game.

In its recent comprehensive energy-sector strategy (AIIB [Asian Infrastructure Investment Bank], 2017b), the AIIB has explicitly committed to shadow carbon pricing in project evaluation, which is very encouraging:

> ***Developing a solid base for economic evaluation.*** The economic evaluation of energy projects raises issues relating to the assumptions used for discount rates, carbon price and externality costs of local pollution, such as: […] low carbon prices underestimate the economic impacts of climate change. The AIIB will use an appropriate discount rate and shadow price for carbon emissions and other externalities in its economic evaluation of projects to determine their economic viability. Considering the lack of consensus about discount rates and carbon prices, the Bank will test the robustness of its economic analyses using a range of different discount rates and carbon prices. (AIIB, 2017b)

Potential lessons for other development banks, including the AIIB and the NDB

Clear analysis is needed of the true climate costs of carbon, and additionally for the costs related to local pollution. Shadow carbon pricing can play a very valuable role in general, but specifically for evaluating projects by development banks, as the EIB has shown. Severe tradeoffs need to be recognised in the cases of some poorer countries and people. A dramatic example is in Mongolia, where people reportedly freeze in the winter if there is not enough heating, which is mainly available from coal-fuelled power (interview material). Coal-fuelled power can have the side benefit of heat. It is always important to see what – if any – alternatives to fossil fuel in specific country and regional contexts exist. As mentioned before, clear stipulations based on environmental and climate standards should complement shadow carbon pricing.

However, the sharp reduction in costs for renewables as well as the use of reverse auctions have led to the increasing commercial viability of renewable energy in many – but not all – countries and regions. This makes the task of funding private investments in renewables easier, even without government or other subsidies.

Shadow carbon pricing is a valuable and necessary tool, especially when renewables are not – or not yet – fully commercially attractive, as is still the case in many countries and with many technologies. This may require some subsidies, either via lending (blended finance) or via subsidies to consumers, such as feed-in tariffs. For poor countries, such subsidies should be funded by donors or special climate funds to avoid having either poor people or poor countries' taxpayers pay the costs.

B. Attracting institutional investors on a significant scale: the IFC's MCPP Infrastructure

We have looked at mechanisms to alter relative returns in favour of renewable energy. Now we turn to mechanisms that will lower the risks for private investors to invest in infrastructure.

The IFC, a member of the World Bank, estimated that $1 trillion a year in additional financing is needed to build infrastructure in emerging and developing economies. The bulk of this investment requires the provision of long-term financing, especially loans, but few banks are willing to provide long-term loans. Therefore, unlocking capital flows for infrastructure from new sources – in particular institutional investors with large assets (see above) – becomes a high priority (IFC [International Finance Corporation], 2017).

In 2016, the IFC launched an innovative programme that aims to raise $5 billion from global institutional investors to invest in infrastructure in emerging and developing markets over the next five years. This will open up a new stream of capital flows to improve power, water, transport and telecommunications systems in developing countries. This programme is being followed with great interest by other MDBs, including the AIIB (interview material).

MCPP Infrastructure aims to significantly scale-up the IFC's debt mobilisation from institutional investors and demonstrate a path for more investors to invest in emerging-market infrastructure by: enabling institutional investors to leverage the IFC's ability to develop and manage a portfolio of bankable infrastructure projects; offering institutional investors a portfolio that has sufficient scale and diversification through a cost-effective portfolio syndication process; and providing credit enhancement though an IFC first-loss tranche to create a risk–return profile akin to an investment-grade profile.

The initiative, called the Managed Co-Lending Portfolio Programme for Infrastructure, builds on the success of the IFC's MCPP, a loan-syndication initiative that enables third-party investors to participate passively in the IFC's senior loan portfolio. In its first phase, the programme allocated $4 billion from China's SAFE Investment Company as well as the Hong Kong Monetary Authority (HKMA) as central bank investors (SAFE $3 billion and the HKMA $1 billion) across 70 deals in less than two years. According to the IFC (2016), it demonstrated how large investors can benefit from delegating the processes of deal origination and approvals to the IFC. In a second stage, partnerships by the IFC were developed with major private-insurance investors: Allianz, East Spring Investment (UK Prudential's Asia asset management unit), Liberty Mutual and Munich Re each already committed to invest $500 million (interview material).

It is interesting that the MCPPs of SAFE and the HKMA cover all sectors and projects at all stages: from greenfield to expansion projects. Allianz and East Spring are used for funding infrastructure projects at all stages. Liberty Mutual and Munich Re are used for co-financing together with commercial banks (interview material).

MCPP Infrastructure is designed for institutional investors seeking to increase their exposure to emerging-market infrastructure. The IFC develops, approves and manages the portfolio of loans that will mirror the IFC's own portfolio in infrastructure. It will do so in a manner agreed

upon up front with its partner investors, which are always subject to the overall governance of the platform.

MCPP Infrastructure is seen by some as a possible breakthrough and a model in the search for large-scale financing solutions to the challenges of development that is funded by institutional investors. With support from the Swedish International Development Cooperation Agency (Sida), the IFC provides a limited first-loss guarantee on the investments to meet the risk–reward profile that institutional investors require.

The IFC is supporting the creation of new private-sector infrastructure debt vehicles. Each vehicle will invest in infrastructure loans originated by the IFC and syndicated through the MCPP platform. Each vehicle will be established to meet the commercial and regulatory requirements of large institutional investors. The IFC creates an emerging-market loan portfolio for institutional investors that mirrors the IFC's own investments. The portfolio is constructed following a passive and rules-based allocation process, in which an MCPP investor is offered a portion of each new eligible loan that the IFC makes. Under the MCPP, investors receive priority access to the IFC's pipeline, benefit from the IFC's experiences in managing emerging-market loans, and lend on the same terms and conditions as the IFC's credit enhancement.

The IFC's investment will be in a first-loss position, subordinated to other senior investors, and improve the risk positions of senior investors to an investment-grade profile. Reportedly, the first-loss position is up to 10 per cent of the portfolio (interview material). This is quite an important commitment by the IFC, and it represents the potential for quite large contingent liabilities. Sida aims to share risk through a guarantee that covers the first loss on a portion of the loan portfolio. Sida-supported loans relate to projects that meet the Swedish priorities for development cooperation. According to IFC estimates, the IFC–Sida partnership enables each $1 invested to mobilise an additional $8-$10 from a third party.

The IFC was able to benefit from the partnership and support Sida, which provides a guarantee on a portion of the IFC's first-loss position in exchange for a guaranteed premium. This helps to mitigate some of the volatility and improve the risk–return profile of the IFC's investment. In turn, the IFC provides a more attractive return to the private-sector investors, ensuring they recover costs and further encourage their participation as first movers under this structure. In addition to improving the risk–return profile of the IFC's investment, the Sida guarantee also significantly reduces the IFC's capital requirements for the first-loss tranche, thereby freeing up capital that can be used to replicate and scale-up the model.

As an innovative debt product, it is designed to leverage the IFC's experiences and expertise in emerging-market investments, as well as the IFC's track record in structuring and managing a globally diversified infrastructure portfolio, in order to unlock institutional investor financing for infrastructure in emerging-market economies.

Historically, the primary platform for mobilising third-party financing into IFC loans has been through syndicated lending. Since its inception, this method has managed to mobilise more than $50 billion, with approximately half of those funds flowing to infrastructure. Given the increasing demand, however, this traditional approach is seen as not being sufficient to satisfy future needs, and additional sources of financing are required.

One large, untapped source of debt financing for infrastructure investment in emerging markets comes from institutional investors that control deep and rapidly growing pools of assets with enormous potential to transform the infrastructure financing landscape. In the Organisation for Economic Co-operation and Development (OECD) countries, total assets under management by "traditional" institutional investors more than doubled in the last decade. This potential, however, has largely not translated to significant amounts of investment into the infrastructure of emerging markets, even though institutional investors are active participants in infrastructure financing in advanced economies. The exceptions to this trend have been large-scale projects in upper-middle-income countries (e.g. China, Turkey and Brazil). But this is not the case for projects in poorer countries, or for smaller projects.

The infrastructure financing gap remains a critical global challenge for sustainable development. The IFC's new Managed Co-Lending Portfolio Programme for Infrastructure seeks to address numerous infrastructure financing challenges that inhibit the flow of resources to emerging markets (IFC, 2016). The programme provides an innovative model for mobilising the financing of infrastructure projects that combines financing from insurance companies, project origination and credit enhancement from the IFC, and support from public-sector donors. Issues such as regulatory uncertainty, project bankability, the lack of data about asset performance and the institutional capacity of procuring governments are constraints that, although complex, can be overcome through the use of appropriate policy levers.

A steeper challenge is to convince investors to participate in a broad range of projects across sectors and countries. The absence of a track record makes it difficult for investors to decide on target returns and asset allocation, while the risk profile is usually sub-investment grade, and therefore outside the risk appetite that dominates the bulk of institutional balance sheets. In addition, the absence of local expertise in smaller markets makes individual credit review impossible or excessively onerous for projects outside of a few large middle-income countries.

If successful, the implementation of the model will provide developmental benefits in two ways. First, it will do so directly through the financing of critical infrastructure projects in emerging markets and low-income countries, enabling these projects to reach financial closure on shorter lead times and for much lower transaction costs. This will accelerate the development of sustainable infrastructure in emerging-market economies and low-income countries. Second, indirect benefits can be expected through a demonstration effect. The possibility of scaling-up a structure that is proven to work and stand on its own would be extremely valuable from a developmental standpoint, in view of the overwhelming financing requirements – with institutional capital taking a critical role – for developing sustainable infrastructure on a global basis. A key issue is to evaluate the actual and potential (in contingent liabilities) possible public costs of such initiatives, compared to the additional private finance it mobilises. However, the fact that it facilitates mobilising long-term private finance from institutional investors seems a clear advantage, and a potentially very valuable precedent for other DFIs, such as the AIIB and the EIB.

C. Funds and facilities pool development and commercial finance: the case of the EIB's GEEREF

(i) Funds for pooling development bank and private finance

In what follows, we first outline the main features of funds and facilities that pool development bank funds and commercial finance. We then describe in some detail one such fund for raising funds for greenfield investments in renewable-energy infrastructure in sub-Saharan Africa: the Global Energy Efficiency and Renewable Energy Fund, created and managed by the EIB (for the latter, we draw on extensive interview material).

Collective investment vehicles or funds are legal entities in which different actors pool their resources to subsequently own equity. The funds are directed towards specific investments, such as climate finance, and thereby use different types of instruments, either in the form of equity, debt or guarantees, or they offer support via technical assistance. Such collective investment vehicles can either be structured in a way that all investors are exposed to the same risk–return profile ("flat structure") or cash flows can be structured, for instance through subordination, whereby some investors have subordinated repayment claims compared to more senior positions. Both structures may mobilise additional commercial investment at the fund level by shifting the risk and/or return profile. When investing the collective funds into projects and/or companies, further commercial finance may be mobilised at the project level (OECD [Organisation for Economic Co-operation and Development], 2017).

Subordination is an effective mechanism to create a security guarantee that appeals to private investors. The structure shields investors from losses incurred by a commercial entity or a portfolio of assets. In the case of companies, subordinated debt as well as junior equity can absorb higher levels of risk and take first losses, compared to senior debt and common equity holders. In the case of a portfolio of assets, subordination provides credit enhancement by creating multiple tranches ("tranching") with different levels of seniority as it relates to the cash flows generated by the Special Purpose Vehicle to pay the notes, starting with the most senior notes, and only repaying subordinated tranches thereafter (this is the so-called waterfall structure). In the blended finance context, development finance providers usually hold the first-loss piece in order to provide a cushion to more senior commercial investors. An alternative form of credit enhancement in a securitised transaction is that, rather than taking the first-loss position, development finance providers may provide guarantees on the senior and/or mezzanine tranche of a subordinated transaction. The EIB, for example, offers this kind of guarantee for tranches with a minimum credit rating equivalent to BB/Ba2 (OECD, 2017).

Interviews with fund managers as well as public and private investors carried out by the OECD (2017) reveal the multiple advantages of funds: profit-sharing opportunities for investors; access to a wide number of deals; reduced transaction costs through economies of scale; focus on a specific investment strategy in terms of geography or sector; following precise investment eligibility criteria and governance rules in terms of communication; reporting and management is defined between the fund manager and investors. For development finance providers, funds are a testing ground for new approaches to scale-up investment for important development outcomes (Danish International Development Agency, 2016). Funds offer development finance providers a chance to mobilise capital at multiple

levels: Development finance actors can blend their capital with investors in the capital structure of the fund itself, or the fund itself can be used to support blended finance transactions at the project level and crowd-in investors for particular projects. We illustrate this below with the case of GEEREF.

Facilities are a popular choice for development finance providers when engaging in blending, as illustrated in the upsurge in blended finance facilities established in the last decade. Between 2000 and 2016, a total of 167 facilities that engage in blending were launched (OECD, 2017; interview material).

Interviews conducted during the 2017 OECD survey reveal additional insights about the two types of funds described above. Structured funds could have more potential to attract institutional investors due to a mid-single-digit return rate, an investment-grade profile due to low levels of volatility, significant vehicle sizes and the liquid nature of assets under management. Flat funds, on the other hand, can cover a range of risk–return profiles (seed capital, social impact funds, growth equity funds, infrastructure equity funds, etc.), and can provide long-term financing (appropriate for illiquid assets such as infrastructure and industrial capacity investment where capital market flows are insufficient). They usually attract DFIs, impact investors, philanthropies and high-net-worth individuals. Flat funds can also be supported by concessional finance from donor governments and aid agencies in the form of grants, technical assistance or concessional loans to support the fundraising and the operations of the fund (rather than within the capital structure of the fund itself, as in the case of layered/structured funds).

(ii) The experience of EIB-managed GEEREF

An important example of how funds can mobilise private investment at different levels is through a "fund-of-funds" approach. A well-known case of this is the EIB-managed Global Energy Efficiency and Renewable Energy Fund. Initiated by the European Commission in 2008, GEEREF has €222 million in assets under management (as of November 2017). It supports the transfer of clean- and renewable-energy technologies to developing countries by providing equity to specialist private equity funds. These funds, in turn, invest in a broad mix of small to medium-sized projects (through equity and mezzanine instruments) in renewable energy – such as solar, biomass and wind farms – and energy-efficiency sectors focussing on the riskier, early-stage development phases. The key idea is to help create a market for renewable-energy and energy-efficiency greenfield investments in poor countries, as well as to have an impact on environmental and social standards (interview material).

These sub-funds also mobilise additional commercial capital. The private-sector investors are mainly high-net-worth individuals and family offices as well as some institutional investors. Pension funds broadly are not interested, as the investment is seen as being too risky; pension funds are also heavily regulated (interview material). Because GEEREF is an alternative investment, it is illiquid. More generally, greenfield projects in emerging and low-income countries imply that higher rates of return are wanted (interview material).

Initial funding came from the European Commission as well as the German and Norwegian governments and totalled €112 million. These "public seed contributions" were then used to fundraise €110 million from private-sector investors, thereby granting GEEREF a blended capital structure. The "fund-of-funds" approach enhances further the leveraging

effect of the public investment and enables commercial investors to diversify their portfolios by taking part in sizeable funds.

It is interesting to see exactly how funds such as GEEREF operate financially. The sequence to return the capital and pay the returns of GEEREF is the following:

1) Pay back private-sector capital.
2) Pay 4 per cent preferred rate of return to private investors.
3) Pay back public capital.
4) Pay 6 per cent preferred return to private investors.
5) Remainder is shared pro-rata between public and private investors.

No additional guarantees are given, but the above sequence and other features clearly mitigate risk. GEEREF started paying back in 2009; up till 2017, it had paid back €160 million. Through both mitigating risk sufficiently and providing acceptable returns, it attracted private capital, though the scale was fairly limited in the first stage.

Raising funds from the private sector has been time- and resource-intensive. Reportedly, GEEREF and its consultants have had 1,000 meetings to attract private capital (interview material). A question may be raised as to whether this is cost-effective or whether transaction costs are too high. However, an important virtue of GEEREF is that it develops interesting new projects, for example the creation of the first standard power purchase agreement in Uganda. Another interesting example is a geothermal plant in Ethiopia. Also, senior EIB staff involved argue that the task is hard. Because markets are not developed, there is often political risk, no previous records, not enough local skill sets and not enough creditworthy counterparties. However, the tasks become easier as these factors are ameliorated. DFIs and development banks influence this process by showcasing project profitability.

As of November 2017, GEEREF's portfolio is comprised of 13 funds. Private funds are first-time fund managers; there are no previous investors (interview material). A local presence is important to support early-stage development. The funds finance small and medium-sized projects, which are more difficult to fund; currently they have 82 projects in total. The equity component is 25 per cent of the total. This requires technical expertise, including on the ground (legal, private equity and technical). For this reason, GEEREF has offices in Singapore, Nairobi, Accra and London. In some countries, investors are really private, such as in the Middle East and North Africa region and South Africa, whereas they are mainly public in the rest of sub-Saharan Africa.

GEEREF operates with like-minded development finance institutions, for example the Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG), the Netherlands Development Finance Company (FMO), the Development Bank of Austria, the CDC and the IFC, which provides co-financing. When several DFIs are involved, environmental and social standards reporting is done for all at the same time. These reports are jointly approved, which simplifies procedures.

Total funds on the ground are, at present, equivalent to $2 billion in assets, but they are expected to grow significantly – up to a possible $10 billion – once all capital is committed and deployed (interview material). Reportedly, GEEREF has a potential 50 times multiplier,

which includes the contributions of private and public financial institutions, through the individual fund, and then through the collective impact of funds. EIB expertise is provided, including due diligence, the appropriate environmental, social and governance guidelines, and endorsements (interview material). More generally, the EIB and government resources help to mitigate and compensate for the risks.

Following, and building on, the success of this model and of GEEREF, the EIB is in the process of fundraising for a successor to GEEREF (GEEREF NEXT), which aims to cover a larger amount of assets under management from commercial investors. Expected public-sector contributions are at $250 million; the private contributions are expected to total $500 million (a 2:1 ratio, which would be higher than with GEEREF). The total would be $750 million, a sum of assets under management that is significantly higher than with GEEREF. The resulting total investment amount would therefore be very large, especially considering the large multiplier involved.

In the paper's conclusion, we look at the possible relevance of both the IFC's MCPP Infrastructure and the EIB's GEEREF for the AIIB and the NDB. Before that, we analyse the AIIB and the NDB.

4 The Asian Infrastructure Investment Bank

As we have seen, renewable-energy infrastructure, as an example of sustainable infrastructure, has some specific characteristics that make public development banks especially relevant. For example, regulatory risks are perceived to be high in this sector, as regulations or broader policies, such as feed-in tariffs, often need to be maintained for long periods to ensure commercial viability. Development banks such as the AIIB and the NDB are well-placed to provide guarantees against such risks, not least because they may be able to mitigate these risks through their close interactions with, and influence on, governments. International infrastructure projects, which involve several countries, to attract private capital may also require guarantees from an MDB such as the AIIB, especially on regulatory aspects, which generally differ between countries (interview material; Griffith-Jones, Xiaoyun, & Spratt, 2016). Also important is that the shadow cost of renewables may be lower than the shadow cost of fossil fuels, as discussed above. Development banks are well-suited to fund projects that take account of the shadow cost of carbon.

4.1 Mandate, members, capital and projects

As its name suggests, the AIIB has been created to help close the very large infrastructure financing gap in Asia. The Asian Development Bank (ADB) estimates the gap to be $1.7 trillion annually, including climate change mitigation measures and the $1.5 trillion without them. This is much higher than previously thought. The current estimates show that, of a total demand of $26 trillion by 2030, the majority of the financing is needed for power ($14.7 trillion) and transport ($8.4 trillion) (ADB, 2017). The AIIB aimed to finance projects for $1.5 billion in 2016, and to increase this to $2.5 billion in 2017 and $3.5 billion in 2018 (MDG Working Group, 2016). It exceeded the 2016 projection by a lending programme by $1.73 billion in 2016 and has doubled the number of projects since then.

The AIIB's Articles of Agreement (AIIB, 2015) describe some important features regarding its focus on sustainable development, foremost in Asia:

> The purpose of the AIIB shall be to: (i) foster sustainable economic development, create wealth and improve infrastructure connectivity in Asia by investing in infrastructure and other productive sectors; and (ii) promote regional cooperation and partnership in addressing development challenges by working in close collaboration with other multilateral and bilateral development institutions.

The AIIB is also investing in projects in non-Asian countries where this indirectly benefits Asia by improving connectivity. The AIIB president, Jin Liqun, highlighted this with the example of potential future projects in Chile, where investments in Asia as well as Latin America will improve the Asia–Latin America connection, thus being beneficial for both: "Better infrastructure across Asia will allow Chilean goods to access new markets, more investment in Chilean infrastructure in turn will further bind together the two great continents of Asia and Latin America" (Reuters, 2017).

The former president of Chile, Michelle Bachelet, referred to the common aim of the AIIB and Chile to link the continents by financing a Trans-Pacific fibre-optic cable in the context of China's One Belt One Road Initiative, or by improving accessibility to ports in Latin America (Reuters, 2017). The general expansive vision is described by President Liqun as follows:

> Expanded membership to Africa, Europe and South America, along with the addition of further members in Asia shows the level of global commitment towards the bank's mission and illustrates the momentum that has gathered since 20 countries signed initial memoranda on establishing the bank less than three years ago. (Reuters, 2017)

The AIIB has three main priorities: *sustainable infrastructure*, which is closely connected to the aims of the SDGs; *cross-border connectivity*, which also includes the connectivity between Asia and countries outside Asia; and *private-capital mobilisation*, which focusses on the issuance of bonds, but also considers blended finance options (AIIB, 2016a).

The bank has 38 regional and 20 non-regional members, and it continues to add members, thus increasing its capital. In 2017 the AIIB accepted four non-regional members: Ethiopia ($45.8 million), Hungary ($100 million), Ireland ($131.3 million) and Portugal ($65 million). It also accepted four regional members: Afghanistan ($86.6 million), Hong Kong ($765.1 million), Iran ($1,580.1 million) and Malaysia ($109.5 million). In total nearly $2.9 billion of capital was added in 2017. Furthermore, the bank lists 22 prospective members: Argentina, Armenia, Belgium, Bahrain, Bolivia, Cyprus, Brazil, Fiji, Canada, Kuwait, Chile, Samoa, Greece, Timor-Leste, Tonga, Madagascar, Peru, Romania, South Africa, Spain, Sudan and Venezuela. Brazil, Kuwait, South Africa and Spain are prospective founding members that are still waiting for ratification (AIIB, 2017c). As African and Latin American states are seeking to join the AIIB, it will allow the AIIB to expand its financing activities to new regions, since it is only allowed to fund projects in member states.

In the Articles of Agreement, a capital stock of $100 billion was authorised (AIIB, 2015). The total subscribed capital of the AIIB, as of November 2017, was $93.2 billion, from which $73.7 billion comes from regional members and $19.5 billion from non-regional members. Regional members hold 77.12 per cent of the voting share and non-regional

me3mbers 22.88 per cent. Voting power is determined by a share of basic votes, with an additional 600 votes for founding members and a number of votes that is equal to the share of capital stock. With $29.78 billion of paid-in capital, China has, by far, the highest share of votes (27.5 per cent), followed by India (7.9 per cent) and Russia (6.2 per cent). The voting power of the bloc of non-regional members is limited, since its total share of capital stock cannot exceed 25 per cent: The additional subscription of shares for non-regional members is only allowed if it does not reduce the share of capital stock held by regional members below 75 per cent (AIIB, 2015, 2017d).

The AIIB is around a third of the size of the World Bank and the EIB. However, its focus is far more clearly in infrastructure, so a higher proportion of its activities will be in that area. As with the World Bank, broadly 20 per cent of subscribed capital is paid in, giving the AIIB $20 billion of useable capital at the outset.

The AIIB has several latecomer advantages: It can draw on the experiences of other banks on issues concerning the more rapid expansion of activities while maintaining lending quality, and on issues of how to best access capital markets. On the other hand, the availability of the Chinese capital market could foster a rate of growth that is much faster than what development banks have experienced in the past (Griffith-Jones et al., 2016).

As of October 2017, the AIIB has 28 projects – with 21 listed as approved – and plans to finance projects in 13 different countries. Coming so soon after its establishment, this suggests that the AIIB is already a well-functioning institution. This is supported by the fact that, in 2017, the AIIB has doubled the number of their approved and proposed projects. Table 2 shows a comprehensive overview of all existing projects that involve AIIB finance, including their total value, status and the actors involved. As can be seen, practically all projects are co-financed with other development banks, especially the World Bank, the ADB and European Bank for Reconstruction and Development (EBRD), but also other entities, especially governments.

Table 2: Current and proposed AIIB projects (as of October 2017)

Current and proposed projects	AIIB financing (in $ millions)	Total volume (in $ millions)	Status	Involved partners and co-financing (in $ millions)
Asia: IFC Emerging Asia Fund	150	640	Approved	World Bank (150), Others (340)
Azerbaijan: Trans Anatolian Natural Gas Pipeline Project (TANAP)	600	8,600	Approved	World Bank (800), ADB (EBRD+EIB 2,100)
Bangladesh: Distribution System Upgrade and Expansion Project	not stated	not stated	Approved	
Bangladesh: Natural Gas Infrastructure and Efficiency Improvement Project	60	453	Approved	ADB (167), Government (226)
Egypt: Round II Solar PV Feed-in Tariffs Programme	up to 210	/	Approved	
Georgia: Batumi Bypass Road Project	114	315.2	Approved	ADB (144)
India: 24x7 – Power For All in Andhra Pradesh	160	571	Approved	World Bank (240), Government of Andhra Pradesh (171)

India: Gujarat Rural Roads (MMGSY) Project	329	658	Approved	Government of Gujarat (329)
India: India Infrastructure Fund	up to 150	750	Approved	
India: Transmission System Strengthening Project	100	303.47	Approved	ADB (50), Power Grid Corporation of India Limited (153.47)
Indonesia: Dam Operational Improvement and Safety Project Phase II	125	300	Approved	World Bank (125), Government of India (50)
Indonesia: National Slum Upgrading Project	216.5	1,743	Approved	World Bank (216.50)
Indonesia: Regional Infrastructure Development Fund Project	100	406	Approved	World Bank (103)
Pakistan: National Motorway M-4 (Shorkot-Khanewal Section) Project	not stated	273	Approved	ADB (Lead Financer), UK Department for International Development (DFID)
Pakistan: Tarbela 5 Hydropower Extension Project (T5HEP)	300	823.5	Approved	World Bank (390), Government of Pakistan (133.5)
Philippines: Metro Manila Flood Management Project	207.36	500	Approved	World Bank (207.63), Borrower (84.74)
Sultanate of Oman: Duqm Port Commercial Terminal and Operational Zone Development Project	262	349.34	Approved	
Sultanate of Oman: Sultanate of Oman Railway System Preparation Project	36	60	Approved	
Tajikistan: Dushanbe-Uzbekistan Border Road Improvement Project	not stated	105.9	Approved	EBRD (Lead Co-Financer)
Tajikistan: Nurek Hydropower Rehabilitation Project, Phase I	60	350	Approved	World Bank (225.70), Eurasian Development Bank (40)
Georgia: 280 MW Nenskra Hydropower Plant	86.7	1,035	Concept decision approved	
India: Amaravati Sustainable Capital City Development Project	200	715	Concept decision approved	World Bank (300), Government of Andhra Pradesh (215)
India: Bangalore Metro Rail Project – Line R6	335	1,785	Concept decision approved	EBRD (583)
India: Madhya Pradesh Rural Connectivity Project	141	502	Concept decision approved	World Bank (211), Borrower (150)
India: Mumbai Metro Line 4 Project	500	2,224	Concept decision approved	Co-Financers arranged by AIIB (200)
Kazakhstan: 40 MW Gulshat PV Solar Power Plant Project	16	69.11	Concept decision approved	EBRD (up to 30)
Sri Lanka: Climate Resilience Improvement Project – Phase II	77.5	155 + local costs	Concept decision approved	World Bank (77.5)
Myanmar: Myingyan 225 MW Combined Cycle Gas Turbine Power Plant Project, Myanmar	20	not stated	Pending Board approval	World Bank, ADB
Source: Compiled by authors based on project data from (AIIB, 2017d)				

4.2 Instruments and commitment to sustainability and renewable energy

4.2.1 Commitment to sustainability and the AIIB's environmental and social framework

The AIIB highlights in its first annual report (AIIB, 2016a, p. 7) that it "will prioritize investments in renewable energy and efficiency, investments that reduce greenhouse gas emissions, and investments that help countries become more resilient to climate change". The bank emphasises that it wants to provide sustainable infrastructure addressing economic, social and environmental sustainability (AIIB, 2016a). The AIIB thus aims to mitigate the risks of climate change and highlights an emphasis on ecosystems, biodiversity and social issues in investment decisions and implementation (AIIB, 2017b). It also ruled lending in other currencies than US dollars. The bank also expressed that it intends to use carbon shadow prices, which is very relevant for the purposes of this paper:

> The Bank will use an appropriate discount rate and shadow price for carbon emissions and other externalities in its economic evaluation of projects to determine their economic viability. Considering the lack of consensus about discount rates and carbon prices, the Bank will test the robustness of its economic analyses using a range of different discount rates and carbon prices. (AIIB, 2017b, p. 18)

In terms of its sustainable-energy guidelines, the bank is following the Paris Agreement, the Sustainable Energy for All initiative, and the 2030 Agenda for Sustainable Development. For supporting client countries, the guidelines are:

(i) develop and improve their energy infrastructure;

(ii) increase energy access;

(iii) facilitate their transition to a less carbon-intensive energy mix;

(iv) meet their goals and commitments under these global initiatives.

The AIIB funds several projects with a strong emphasis on sustainability. So far, $610 million has been committed to renewable energy projects, and it is likely that falling energy costs for renewables will lead to a stronger focus in the future. The AIIB is cautious about financing hydro plants due to the potential environmental and social risks (BNEF, 2017).

Nevertheless, and unlike the NDB till now, it also invests in non-renewable-energy projects. Because the AAIB has invested $600 million into the Trans Anatolian Natural Gas Pipeline Project (TANAP) and $60 million in the Natural Gas Infrastructure and Efficiency Improvement Project in Bangladesh, it is evident that the AIIB still sees gas as being important. Whether this is the right approach can be regarded as controversial – the decision of lending to gas projects must also be made while considering the development status of a country. However, the AIIB does not finance any coal-based energy projects and, despite that half of all global oil and gas reserves are in Asia, it strongly emphasises a commitment to non-fossil investments:

> The Bank will finance investments that are demonstrably compatible with a country's transition toward sustainable, low-carbon energy and internationally agreed targets. Supported fossil fuel-based generation facilities would be expected to use commercially available, least-carbon technology. In many countries, gas-fired power generation would

> form part of such transition. Carbon efficient oil- and coal-fired power plants would be considered if they replace existing, less efficient capacity or are essential to the reliability and integrity of the system, or if no viable or affordable alternative exists in specific cases. The Bank will pay attention to the particular needs of its less developed members. (AIIB, 2017b, p. 17)

Regarding gas transport, the following is offered:

> The Bank will also consider development, rehabilitation and upgrading of natural gas transportation (including storage) and distribution networks, and control of gas leakage, to foster greater use of gas during the transition to a less carbon-intensive energy mix/power sector, especially in Asia, where such penetration is low compared to other regions. (AIIB, 2017b, p. 17)

The AIIB excludes investments in nuclear power and would just consider very special cases of safety improvement projects. However, they state a lack of expertise, which could also be the main reason for exclusion rather than safety and environmental concerns (AIIB, 2017b).

Also, the AIIB vice-president, Joachim von Amsberg, underlines that the AIIB will not rule out coal but emphasises that the AIIB is currently not financing coal-fired plants:

> Our intention is to focus on clean energy sources, but we don't want to absolutely rule out coal under any circumstances. There may be countries that have no viable alternative. I can add that we have no coal-fired plants in our pipeline. This may be a discussion of the past rather than the future, because the future clearly lies in renewable energy. (BNEF, 2017)

Overall, the AIIB commits to a pragmatic energy transition – including mitigation of climate change risks and improving climate change resilience – that focusses on renewable energy, but it also sees gas as an important resource for a successful transition. The point made above about the bank using different shadow carbon prices may be relevant here. Simply put, the lower the shadow price of carbon, the more likely it is that non-renewable technologies will pass the bank's internal assessment. If the price is low enough, coal could meet this threshold, but if it is very high, then even gas would not. As well as having a mandate to invest in renewable energy – and shadow carbon pricing to provide incentives for this – investment decisions will be heavily influenced by choices such as the shadow price level. Furthermore, it may be interesting for the AIIB to consider limits on carbon emissions per tonne, such as the EIB has, perhaps especially in the relatively richer countries (see Section 3 above).

As also pointed out above, it is important to remember the issues of energy poverty and affordability in this regard. A very high shadow carbon price may lead to investment in renewable technologies that are actually quite expensive, especially in the next decade, even though the costs for renewables are expected to continue declining. To avoid the cost of this falling on the governments of low-income countries – or, more importantly, their citizens, in the form of energy costs – it is important that these costs are met externally. Climate finance providers such as the Green Climate Fund are the obvious source, and a reasonable rule of thumb would be that any costs above the least-cost, locally available alternative in LICs should be met in this way.

Regarding environmental and social safeguards, the AIIB's framework recognises issues such as labour rights, gender equality, stakeholder engagement and biodiversity. It further

requires clients to provide environmental and social documentation and can request that the client conducts measures such as risk mitigation, comprehensive resettlement planning and/or a special plan to address potential effects on indigenous peoples. It also excludes several projects based on an environmental and social exclusion list that follows international conventions. The AIIB offers member states support in their environmental and social assessments if they lack the capacity for it (AIIB, 2016b). Drawing on the experiences of different international stakeholders, the bank describes the final framework now as being broadly consistent with those of other MDBs such as the ADB, the EBRD, the EIB and the World Bank (AIIB, 2016a), which may have been helped due to a positive learning effect through the inclusion of non-regional members, as well as drawing on the experiences of Asian countries, including China.

The core principles of lean, green and clean (AIIB, 2016a) emphasise the importance of the speed of operations – which is a major priority for borrowers and an important criticism of borrowing governments as well as the private sector – of many existing MDBs. The aim should be to maximise the speed of operations without reducing the quality of economic, social and environmental outcomes. This is a critically important area where the AIIB could bring real additionality. By commencing operations, the AIIB will automatically increase the *quantity* of investment in infrastructure. If it can also accelerate the investment process, this quantity effect will be amplified, particularly if other MDBs can learn from its innovations. If it can achieve this while also maintaining – or even enhancing – the *quality* of projects, the positive development impacts will be huge (Griffith-Jones et al., 2016).

Rather than expect new institutions such as the AIIB to adopt those standards of longer-standing equivalents, such as the World Bank, an attractive option would be for new and old development banks to come together and forge a new set of environmental and social safeguards, with the express aim of marrying the speed of approval and implementation with high, legitimate and transparent standards.

4.2.2 Co-lending and blended finance

The AIIB has already approved several projects in collaboration with multiple partners. Current and possible future partners include the World Bank (World Bank and IFC), the ADB, the EBRD, the EIB, the Eurasian Development Bank (EDB), the UK Department for International Development, several other national government entities, as well as commercial lenders and national development banks.

Its largest project, TANAP, has a large number of involved partners and co-financing institutions – including the World Bank, the ADB, the EBRD and the EIB – to provide the large sum of $8.6 billion. Large amounts of AIIB finance for projects, which have already been fully approved, are going to the Tarbela 5 Hydropower Extension Project in Pakistan and the National Slum Upgrading Project in Indonesia. Both projects are co-financed by the World Bank. The fact that most approved and proposed projects include co-financing from the World Bank shows the existing strong linkage between these two institutions. It is also important to note the contribution to the Emerging Asia Fund, which was established by the World Bank and the IFC.

The AIIB will issue bonds and use interbank market transactions to raise public and private funds. However, although green bonds might be a possibility, the AIIB has not used this

option yet. At present, its large initial capital is seen as being sufficient to postpone accessing international capital markets (BNEF, 2017). Nevertheless, the AIIB has a strong starting position, having received triple A ratings from Moody's, Fitch and S&P (AIIB, 2017a).

The AIIB also considers blended finance options with private-sector investors. Possible considered options are ranging from senior syndicated loans to equity investment for non-sovereign-backed loans (AIIB, 2016a).

Its private-sector co-financing model is comprised of the following guidelines (AIIB, 2017b, p. 13):

> (i) explore innovative models to catalyze private investments, and significantly increase their contribution to meet the infrastructure needs of countries in Asia, especially those that are budget-constrained;
>
> (ii) build upon the successful experience of and lessons learned by MDBs operating in Asia, especially in [public–private partnerships], ensuring that the costs and risks are appropriately shared and distributed;
>
> (iii) explore with clients and private partners new cooperation modalities to meet country needs;
>
> (iv) in doing so, avoid crowding out the private sector. When pursuing such opportunities, the Bank will evaluate risk carefully and ensure that appropriate measures are put in place to mitigate and manage such risks.

5 The New Development Bank

5.1 Mandate, members, capital and projects

The NDB was created in mid-2014 by the governments of Brazil, Russia, India, China and South Africa at the sixth BRICS summit in Fortaleza, Brazil. The first important characteristic is its large initial capital stock of $50 billion, which makes it likely that its lending level will come close to that of traditional development finance actors in the near future (Griffith-Jones, 2014, 2015). Moreover, the NDB clearly committed in its Articles of Agreement to infrastructure and sustainable development, as can be seen in its current projects, which primarily fund sustainable infrastructure. The mandate of the NDB emphasises infrastructure and sustainable development, as written in Article 2 of the Articles of Agreement (NDB, 2014):

> The purpose of the Bank shall be to mobilize resources for infrastructure and sustainable development projects in BRICS and other emerging market economies and developing countries to complement the existing efforts of multilateral and regional financial institutions for global growth and development.

Article 3 (NDB, 2014) gives the functions to fulfil these purposes:

> (i) to utilize resources at its disposal to support infrastructure and sustainable development projects, public or private, in the BRICS and other emerging market economies and developing countries, through the provision of loans, guarantees, equity participation and other financial instruments;

> (ii) to cooperate as the Bank may deem appropriate, within its mandate, with international organizations, as well as national entities whether public or private, in particular with international financial institutions and national development banks;
>
> (iii) to provide technical assistance for the preparation and implementation of infrastructure and sustainable development projects to be supported by the Bank;
>
> (iv) to support infrastructure and sustainable development projects involving more than one country;
>
> (v) to establish, or be entrusted with the administration, of Special Funds which are designed to serve its purpose.

The initial authorised capital was $100 billion; the initial subscribed capital was $50 billion and equally divided by the five founding members: Brazil, China, India, Russia and South Africa – $2 billion is paid in capital and $8 billion is callable capital for each of the founding members (NDB, 2014).

As of November 2017, the NDB financed 11 projects in all five founding member countries, with a total value of $2.98 billion. Almost half ($1.4 billion) was invested in renewable-energy or energy-conservation projects, accounting for 2,168.8 megawatts (MW) of output of renewable energy, which equals approximately 4.4 million tonnes of CO2 avoidance per year. The remaining projects are for water, road and social infrastructure. See Table 3 for a comprehensive list of projects:

Table 3: List of NDB projects (as of November 2017)

Project	Loan amount	Sov. /non-sov.	Borrower	Guarantor	End-user/ on-lendee	Lending modality	Target sector	Development impact
Canara (India)	$250m	Sovereign guaranteed	Canara Bank	Gov. India	Sub-projects	Sovereign guaranteed: 3 tranches	Renewable energy (wind, solar, etc.)	500 MW renewable energy Avoided 815,000 tCO2e/year
Lingang (China)	RMB 525 ($81m)	Sovereign	PRC govern-ment	-	Shanghai Lingang Hongbo New Energy Development Co. Ltd.	Sovereign project loan	Renewable energy (solar rooftop PV)	100 MW solar Avoided 73,000 tCO2e/year
BNDES (Brazil)	$300m	Non-sovereign	BNDES	-	Sub-projects	National financial intermediary: two step loan	Renewable energy (wind, solar, etc.)	600 MW renewable energy Avoided 1,000,000 tCO2e/year
ESKOM (South Africa)	$180m	Sovereign guaranteed	ESKOM	Gov. RSA	ESKOM	Sovereign guaranteed project loan	Renewable energy (transmission)	670 MW renewable energy evacuated (transmitted) Avoided 1,300,000 tCO2e/year

EDB/ IIB (Russia)	$100m	Non-sovereign	EDB/IIB	-	Nord HydroBely Porog + other sub-project(s)	National financial intermediary: two step loan	Renewable energy (hydropower) + green energy	49.8 MW renewable energy Avoided 48,000 tCO2e/year
Madhya Pradesh (India)	$350m	Sovereign	Govern-ment of India	-	Government of Madhya Pradesh	Sovereign project finance facility	Upgrading major district roads	About 1,500 km of MDRs will be upgraded
Pinghai (China)	RMB 2m ($298m)	Sovereign	PRC govern-ment	-	Fujian Investment and Development Group	Project loan	Renewable energy (wind power)	250 MW wind Avoided 869,900 tCO2e/year
Hunan (China)	RMB 2m ($300m)	Sovereign	PRC govern-ment	-	Sub-project PIUs in Changsha, Zhuzhou and Xiangtan	Sovereign project finance facility	Water, sanitation and flood control, environment	Improved water quality and flood control in the main streams and tributaries of Xiang River
Jiangxi (China)	USD 200 m	Sovereign	PRC govern-ment	-	Government of Jiangxi Province	Sovereign project finance facility	Energy conservation	Savings of 95,118 tons of coal equivalent Annual CO2 emissions reduction is 263,476 tonnes
MP Water (India)	$470m	Sovereign	Govern-ment of India	-	Government of Madhya Pradesh	Sovereign project loan	Water supply and sanitation, rural development	Project covers more than 3,400 villages and will benefit over 3 million rural population
Judicial support (Russia)	$460m	Sovereign	Govern-ment of Russian Federation	-	Beneficiaries – Supreme Court, Moscow City Court and District Courts, Federal Bailiffs Service	Sovereign project loan	Social infrastructure	Increased judicial transparency and efficiency, and enhanced protection of judicial rights of citizens of the country
Source: Compiled by authors based on the NDB (2017c)								

5.2 Future members, co-lending and future strategy

Although the bank was originally a BRICS institution, in April 2017 the NDB Board approved new Terms, Conditions and Procedures for the Admission of New Members and agreed to target countries to invite them for admission (NDB, 2017b). Some of the BRICS

states seem more committed to the NDB than the AIIB. For example, Brazil and South Africa immediately committed to the NDB but have still not ratified their memberships of the AIIB (Financial Times, 2017).

The basic criteria for admission are described in the following excerpt from the Articles of Agreement (NDB, 2017d):

> i) Membership of the United Nations.
>
> ii) Subscription to a capital share of the Bank. Shares to be subscribed by new members will be determined by negotiation in line with a framework previously approved by the Board of Governors.
>
> iii) Acceptance of the schedule of payments of the paid-in capital determined by the Board of Governors.
>
> iv) Acceptance of the methodology established by the Board of Governors pertaining to the representation of new members in the Board of Directors.

The Terms, Conditions and Procedures for the Admission of New Members to the New Development Bank, which were agreed on in 2017 at the 2nd Annual Meeting of the NDB Board of Governors in New Delhi (NDB, 2017d), added new conditions:

> v) Willingness to be bound by and undertake all other obligations arising from the Agreement on the New Development Bank and the provisions of the Articles of Agreement.
>
> vi) Acceptance of the strategic objectives and principles of the Bank as approved by the Board of Governors.
>
> vii) Acceptance of the policies and procedures of the Bank as approved by the Board of Directors or, as the case may be, by Management.
>
> viii) Confirmation that the internal procedures necessary for it to become a member will be/have been followed.

Although new members would not be allowed to surpass the voting power share of 55 per cent of the BRICS founding members (NDB, 2014), they will be represented on the Board of Governors and in the Board of Directors, and the basic voting system is that one additional share equals one additional vote (NDB, 2017d):

> a) Upon being admitted to the Bank, the member shall appoint one Governor and one alternate Governor in accordance with the provisions of the Articles of Agreement.
>
> b) Management shall discuss with the Board of Directors and submit to the Board of Governors for consideration and approval the methodology by which additional Directors and alternates shall be elected.
>
> c) New members shall elect Directors and alternates to represent them in the Board in accordance with the methodology established by the Board of Governors. The total number of Directors shall be no more than 10(ten). One Director and alternate may represent more than one member.

The main drivers for expansion are not only a desire to expand paid-in capital, but also to increase the bank's profile and international standing, thereby reducing the concentration of the portfolio along with a diversification of the operation sphere. The bank also seeks to learn from the experiences of additional members in terms of project design and

implementation. The NDB actively promotes itself to prospective members as being a bank with "reduced bureaucracy, reliance on country systems whenever possible, and streamlined provision of development services without policy conditions attached" (NDB, 2017a). The NDB expressed that increases in membership will happen gradually and with a reasonable mix of countries at different income levels (NDB, 2017a).

5.2.1 Instruments and sustainability commitment

a) Commitment to sustainable infrastructure

The NDB is a good example for other development banks because of its mandated commitment to sustainable infrastructure and clean energy. The NDB stated in its operational strategy for 2017-2021 that it will dedicate two-thirds of finance to sustainable infrastructure, including renewable energy and energy efficiency. This was exceeded in 2016, primarily by investments in renewable-energy projects, when 78 per cent ($1.56 billion) of its investments was dedicated to sustainable infrastructure. The bank emphasises its role in basic energy provision to mitigate the weaknesses of private finance and public-sector institutions (NDB, 2017a).

This marks an interesting distinction with the AIIB and shows that there is more than one way of "skinning a cat". As we saw, shadow carbon pricing can incentivise sustainable infrastructure investments from development banks, particularly in cases where the price is quite high. On the other hand, a clear stipulation that a high percentage of investments must be in these sectors could create the same effect. The advantage of using shadow-priced-based approaches, however, is that it will also incentivise the most efficient and lowest-cost technologies, but only if the price is set at the right level.

The bank highlights, in particular, the role of new technologies such as energy storage and smart grids. It can therefore be expected that the NDB will become a frontier financier for innovative renewable-energy solutions, which could boost innovation in the renewable-energy sector in emerging countries (NDB, 2017a, p. 20):

> NDB supports the shift to a more sustainable energy path through: i) structural transformation of the energy sector, in particular by promoting emerging renewable technologies; ii) energy efficiency, including the upgrade of existing power plants, overhaul of electricity grids and energy-efficient building techniques; and iii) reduction of air, water and soil pollution in the energy sector. Specific projects could include: offshore wind energy, distributed solar energy generation, hydro-power plants and smart urban energy systems. NDB emphasizes in its operations the adoption of innovative new technologies, such as energy storage systems, adaptable smart electricity grids and solid-waste-based energy generation.

As argued above, these are crucial issues that need to be addressed, particularly as renewable costs fall and their share in the energy mix progressively rises.

Although the mandate only addresses sustainable infrastructure by mentioning "sustainable development", the dominance of renewable-energy projects indicates a strong commitment towards sustainable infrastructure from a climate change mitigation perspective. However, the NDB did not rule out future non-renewable-energy projects such as "clean" coal and

nuclear energy, perhaps reflecting the availability of such resources in several of the large member countries. Similarly to the AIIB, the NDB president, K V Kamath, highlights the initial capital costs of renewables as a potential bottleneck for developing countries. He expresses that a sole focus on renewables will be primarily price-dependent and that coal should only be completely abandoned if the price of a thermal plant equals that of green alternatives. However, the dropping costs of renewable energy offer a positive outlook for the future (NDB, 2016):

> Not to do coal that is harmful, that is done in a traditional manner. We will examine [such projects] very closely […] If the initial capital cost of setting up an alternate power generating system is equal to that of thermal plant, then I think it becomes an open and shut case. I think it is heading there. The question that could come up for developing countries is the burden of that heavier initial capital cost. I am reasonably sure costs will drop and efficiencies will improve to make this a feasible option.

The NDB calls itself a "firm advocate of sustainable infrastructure" (NDB, 2017e, p. 20). In its 2016 annual report, Towards a Greener Tomorrow (NDB, 2017e, pp. 15-16), it emphasised, with regards to ecological and social sustainability, that it:

> recognizes the importance of maintaining policy and operating standards that promote sustainable development, align with international good practices and effectively respond to environmental and social risks;
>
> promotes the use of strong country systems in the management of environmental and social risks and impacts;
>
> adheres to the principles of environmental and social sustainability to ensure minimal adverse impact on the environment and people from its financing and investments in infrastructure and sustainable development projects;
>
> seeks to promote mitigation and adaptation measures to address climate change. NDB aims to build upon existing green economic growth initiatives and provide support for new ones at regional, national and sub-national levels, as well as private sector. The Bank also encourages climate proofing of its infrastructure financing and investments to build resilience to climate change;
>
> promotes the conservation of natural resources, including energy and water. Furthermore, the Bank supports sustainable land management and urban development.

It also expressed its strong emphasis on gender equality: "[O]ne of the key future objectives of the Bank is to mainstream gender equality issues in all of its operations."

However, while the bank mentions a "precautionary approach to justify discretionary decisions in situations where there is the possibility of environmental and social harm resulting from project decisions", it is unclear how strong this safeguard is (Vazquez, Roychoudhury, & Borges, 2017).

b) Green bonds

The NDB's position on green bonds is closely related to the Chinese Green Bond Market, which was established in December 2015 and has become the largest in the world. Whereas the market has an expected volume of $230 billion within the next five years and is likely to expand during the push to trade corporate green bonds (Bhattacharya et al., 2016), the

NDB only issued one green bond of RMB 3 billion ($448 million) with a tenor of five years (NDB, 2017e). The NDB applies an independent third-party verification to ensure that projects can be classified as green (NDB, 2017a).

It is common for Chinese issuers to seek third-party verification before submitting the issuance applications to securities exchanges or regulators. It is not just independent, domestic verifiers who are involved, but also major agencies such as Ernst & Young, PricewaterhouseCoopers and Deloitte. A unique feature of China's green bond principles is the inclusion of pollution (OECD, 2016). This may create an opportunity for the NDB to invest in non-infrastructure projects such as pollution mitigation (NDB, 2017a):

> In keeping with its intention to be a demand-driven institution that responds to requirements of borrowing members, NDB will remain open to financing projects in a broad range of developmental areas, including traditional infrastructure and sustainable development projects like environmental protection or pollution mitigation.

Overall there is a strong emphasis on green bonds as a future borrowing instrument, which can be considered as being closely aligned to the general green bond policy of China.

c) Other potential instruments for the AIIB and the NDB

To achieve greater leverage over time, other instruments such as guarantees to private investors and lenders will need to be developed to complement loan instruments. Guarantees are safer from a development bank perspective if they are at least partly funded ex ante, and if the risks for which guarantees are provided are clearly capped so that risks are not open-ended (see also Griffith-Jones & Kollatz, 2015). Alternative instruments that potentially can provide more leverage are complicated to arrange and may actually deliver very few transactions, and thus very little volume, as has been the experience of other MDBs such as the World Bank and the EIB (based on interview material; see also Griffith-Jones & Kollatz, 2015).

6 Conclusions

The need for far greater investment in renewable infrastructure is very clear. This is because there is not only a great need for sustainable infrastructure to meet the Paris Agreement goals, but also a great need for additional infrastructure to support development and poverty reduction (with large numbers of poor people not having access to basic utilities, such as electricity). There is also an urgency for such investments to happen soon, as the investments being made in the next few years will be locked in for the long term – this is especially true for renewable energy projects with their long lifecycles. This additional investment will not only help to mobilise private capital by making sustainable infrastructure more cost competitive in general, but it is also required to promote specific technologies that are not currently attractive enough for private investors, including, for example, renewable energy in certain sectors and regions as well as storage costs.

A very important role in financing such investment in sustainable infrastructure is – and will increasingly be – played by MDBs, including the newly created AIIB and NDB. The large scope of the AIIB and the NDB implies a valuable addition to development finance in that

area. The AIIB and the NDB will also benefit from the extensive experience that the older development banks offer. This paper aims to contribute to this latter process by examining the experiences of older development banks – especially the EIB, but also others, including the IFC – and their potential relevance for the newer development banks.

Development banks can, and do, finance sustainable infrastructure through their own lending and investing, as well as help catalyse private lending and investment. As regards the former, simple instruments, such as plain vanilla loans, may be the most appropriate, especially for a new MDB just beginning operations. These plain vanilla loans can, of course, be combined with co-financing by private lenders and investors, as well as with other development banks. (The AIIB, in particular, has started its operations mainly by participating in projects already designed by other MDBs, such as the World Bank, the ADB, the EIB and others.)

Even though simple instruments may be better during an initial phase – especially for well-capitalised banks such as the AIIB, as these simpler instruments are easier and quicker to implement, have lower transactions cost and carry fewer risks – it may be desirable for achieving greater leverage over time. For this reason, other instruments that provide greater guarantees to private investors and lenders need to be developed to complement plain vanilla loan instruments. This can catalyse greater levels of lending and investment from a range of private lenders and investors, including institutional investors. Furthermore, it would be important to develop common standards among the MDBs and DFIs for blended finance in order to avoid competition on financing conditions.

Here, the AIIB and NDB can build on the experiences of institutions such as the IFC and the EIB. We analysed in some depth two interesting instruments: the IFC's Managed Co-Lending Portfolio Programme and the EIB's Global Energy Efficiency and Renewable Energy Fund. The IFC's MCPP is very innovative, as it has already attracted significant amounts of investment from large insurance companies to co-finance a portfolio of IFC projects – both in the construction phase as well as in later phases – in a variety of emerging and developing countries. These institutional investors have been attracted by the idea of co-investing with the IFC as well as by its broad investment expertise in infrastructure across many countries; by the diversification of the portfolio; and also by the implicit guarantee given by a first-loss provision, reaching 10 per cent of total loans, which are partly funded by Sida. The latter aspect may require further analysis, as it does imply some fairly large contingent liabilities for the IFC. However, in other aspects, this seems to be a very attractive instrument, especially as it helps catalyse investment from institutional investors, which was the "holy grail" of development finance experts. This is because these institutional investors have the long-term assets needed to fund long-term investment in sustainable energy, especially those projects that only become profitable over the long term.

The other instrument studied is the EIB's GEEREF, which is also very innovative, as it funds greenfield investments in small and medium-sized projects in emerging and especially low-income countries. GEEREF provides equity to specialist private equity funds. These funds, in turn, invest in a broad mix of small to medium-sized renewable energy projects (through equity and mezzanine instruments) – such as solar, biomass and wind farms – as well as in energy-efficiency sectors focussing on the riskier, early-stage development phases. The key idea is to help create a market for renewable-energy and energy-efficiency greenfield investments in poorer countries, as well as to have an impact on environmental and social standards. GEEREF has a "fund of funds" approach, and has a targeted multiplier

(up to 50) in terms of the total private capital it intends to attract. GEEREF is broadly seen as being very successful, as is shown by the fact that donors are providing capital for a larger GEEREF NEXT initiative. One problem has been the high transaction costs of raising private capital, as well as other aspects. However, it can be expected that the demonstration effect of GEEREF and its projects on the ground will make the task easier for GEEREF NEXT and similar funds in other institutions. Indeed, GEEREF is one very interesting example of a fund or facility that pools development bank funds and commercial finance.

Clearly the IFC's MCPP, which seems to be very successful in attracting institutional investors for co-financing, is of great relevance both to the AIIB and the NDB. In fact, in our interviews, we found that the AIIB is carefully studying the experiences of the IFC's MCPP, with a view to possibly replicating or adapting them. Another option would be for the AIIB to co-finance in the same facility with the IFC, as it has been the recent tradition of the AIIB to collaborate with the World Bank and regional development banks on many projects and initiatives. It is also interesting to note (see above) that the IFC's MCPP started with major contributions from China's SAFE Investment Company and the HKMA. Possibly a similar initiative could be started by these institutions for the AIIB and attempt to attract both international and Chinese institutional investors. A similar analysis applies to the NDB, though it has up to now collaborated less with the World Bank. A final caveat is that this may be relatively less urgent for these new banks, as they have, at present, such a strong capital base (especially the AIIB) and therefore a great deal of space for additional lending. However, as this lending capacity becomes more constrained, it will become ever more relevant.

As regards the EIB's GEEREF, it is again a very interesting instrument, and of relevance to other development banks. However, its relevance to the AIIB and the NDB in these early phases seems less clear. Its transactions costs seem very high, and it is quite labour-intensive for EIB staff. However, some collaboration and possible co-financing between the EIB and both the AIIB and the NDB may be an interesting possibility, especially in the future.

The abovementioned instruments are for reducing risks to make sustainable infrastructure investments more attractive to private lenders and investors. However, the important prior decision is the choice of what projects the development bank will choose to help finance. Here, the EIB has been pioneering an important approach, already since the mid-1990s, by introducing shadow carbon pricing, which allows for including the social costs of carbon in the project evaluation – first in the energy and transport sectors, and then across all sectors. This approach, which has now been strongly endorsed more generally for the broader economy by a Commission chaired by Joseph Stiglitz and Nicholas Stern, implies that low-carbon projects such as renewable-energy ones are more likely to be chosen than high-carbon ones, such as those based on fossil fuels. This seems to have clearly been the case for the EIB's projects. However, in situations where coal became more profitable, the shadow carbon price approach of the EIB was reinforced by internal regulations, preventing high-carbon-emission projects from being funded, except in very poor countries.

This experience of the EIB seems to be of high relevance to the AIIB and the NDB. Indeed, the AIIB has committed to using shadow carbon pricing, and the NDB to dedicating a high proportion of its activities to sustainable infrastructure. However, issues may remain due to the existence in some countries and regions of significantly lower costs for fossil fuels, in comparison to renewables, at least in the short and medium terms. A lack of resources for

renewable energy can also be a problem, in particular for regions or countries where an abundance of fossil fuels may be available. This may imply the need for either maintaining investments in some “less bad” fossil fuels, such as natural gas, for the transition, and/or maintaining investments in climate funds or donor grants that provide subsidies to protect poor countries and poor people from paying higher energy costs due to the introduction of renewable energy.

Besides focussing on specific instruments for encouraging a choice of more sustainable energy sources, we have discussed several mechanisms needed to attract further private lending and investments into sustainable infrastructure, and where development banks – both old and new – can play an important, indirect role. These include modifying financial regulations (including Basel III and Solvency II) so they do not have excessive bias against long-term lending or investing; helping deepen local capital markets in emerging and developing countries, including by encouraging the development of local currency instruments; and helping develop a pipeline of good projects in the area of sustainable infrastructure. The latter can be done at two levels. A first approach is to help fund facilities that provide financing for project preparation, especially for poorer and smaller countries; the AIIB has, for example, created such a facility, which is valuable. A second, more ambitious, approach is for these MDBs, both old and new, to help develop – including at the sub-national level, for example big cities – ambitious projects for greening the economy, for example designing greener public transport. Both those approaches, but especially the latter, would help scale-up the preparation of shovel-ready sustainable projects – or mega projects – that could then be funded.

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Appendix

List of people interviewed between October and December 2017

Monica Arevalo, EIB

Irene Basile, OECD

Amar Bhattacharya, Brookings, former Director of the G-24

Markus Berndt, EIB

Sean Fitzpatrick, EIB

Edward Calthrop, EIB

Catharina Dyvik, previously EBRD, now with SYSTEMIQ/the Blended Finance Taskforce

Naeeda Crishnamorgado, OECD

Paul Horrocks, OECD

Jingdong Hua, Vice-President and Treasurer of IFC

Sean Kidney, Climate Bonds

Chris Knowles, EIB

Jeremy Oppenheim, SYSTEMIQ/Head of the Blended Finance Taskforce

Jens Sedemund, OECD

Katherine Stodulka, SYSTEMIQ/the Blended Finance Taskforce

Anell Tripathy, Climate Bonds

Joachim Von Amsberg, Vice-President AIIB, formerly Vice-President of the World Bank

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