BREAKING SILOS: ACTIONS TO DEVELOP INFRASTRUCTURE AS AN ASSET CLASS AND ADDRESS THE INFORMATION GAP

An Agenda for G20

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Policy and industry initiatives have been launched to build a better understanding of infrastructure at the macro and micro level. Taken together, all of these data sources and methods used in these initiatives may be applied to help close the data gap in infrastructure, charting a course forward that better describes investment expectations for both policymakers and investors.

The aim of this report is to develop proposals for addressing the main gaps in information focusing in particular on infrastructure financing and the role of private sector. The proposals build on the two Workshops on Data collection for Long Term Investment held on the 2nd November and 10th of May 2017, supporting the G20/OECD Taskforce on Institutional Investors and Long Term Investment Financing, as well as on the OECD and Long-term Infrastructure Investor Association (LTIIA) Joint Forum on Developing Infrastructure as an Asset Class on 18 October 2017. Actions proposed are also building on the OECD report "Addressing Data Gaps in Long Term Investment: an Agenda for Research" developed in cooperation with other countries and international organisations for the G20 (e.g. Canada, Italy and the BIS). The G20 could play a key role in helping to advance the proposed agenda for research, building on countries and IO's contributions.

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BREAKING THE SILOS: DEVELOPING INFRASTRUCTURE AS AN ASSET CLASS AND ADDRESSING THE INFORMATION GAP[1]

This document evolved from a background note that was used for two Workshops on Infrastructure as an Asset Class and Data Collection for Long-term Investment, which were held on 2 November and 10 May 2017 and supported the G20/OECD Taskforce on Institutional Investors and Long Term Investment Financing, as well as for the OECD and Long-term Infrastructure Investors Association (LTIIA) Joint Forum on Developing Infrastructure as an Asset Class on 18 October 2017. It received comments and feedback from Taskforce members and participants to the Workshops and Joint Forum event.

The note includes first an overview on G20 work on Data Gaps for Long Term Investment (LTI) with proposed actions to the G20 and next steps for the G20/OECD Taskforce discussed at the Workshop. The main policy questions at stake for mobilising private sector financing are included in the next section as well as a research agenda on data gaps/analytical work, with specific areas of work and actions. The last section provides background on use of micro data for the analysis of infrastructure investment, the nature of the data available, methodological aspects and recent initiatives on data collection.

The proposed distinct but inter-related actions part of this research agenda - discussed at the G20/OECD Taskforce - would build on each other (often using similar or related datasets) aimed at overcoming the silo approach often used in the different policy areas related to infrastructure (i.e. financial regulation, development finance, green finance). Taken together these actions, would re-inforce policy insights and messages, provide a rich basis to enhance the understanding of policies in infrastructure investments, and ultimately contribute to pushing forward the G20 work on infrastructure as an asset class.

This note builds on earlier reports for the G20, in particular: OECD (2015) "*Addressing Data Gaps in Long Term Investment: an Agenda for Research*", which was developed in cooperation with other countries and international organisations for the G20 (e.g. Canada, Italy and the BIS) and a FSB, IMF, OECD, WBG (2014) report on "*Development of quantitative indicators of long-term investment finance*".

BACKGROUND AND G20 WORK ON DATA GAPS FOR LTI

Infrastructure investment contributes to higher productivity and growth, facilitates trade, connectivity[2], and improves economic inclusion. This is however only the case for sustainable/quality[3] long-term investments: high-impact projects developed in a cost efficient and affordable manner, delivering positive risk adjusted returns to investors, while also taking into account[4] social and environmental impact. In all countries, the poor derive the greatest relative benefit from access to public infrastructure in the form of transportation, clean water, sanitation, energy, education, and healthcare[5]. Thus sustainable/quality infrastructure can broadly contribute to the United Nations Sustainable Development Goals (SDGs) and play an important role in achieving the goals of the Paris Agreement and the transition towards a low-emission and climate-resilient economy[6].

Given the considerable need for long-term infrastructure investment, countries need to improve the efficiency of public investment while mobilising private investment at scale and at pace[7]. Diversifying the types of financial stakeholders and sources of finance for such investment through new financing and funding structures, and innovative financial tools, can help align public and private sector interest in infrastructure provision and management, while optimising the capital structure and reducing the cost of capital for the public sector[8].

In the case of long-term investors such as institutional investors, despite increasing interest, total amounts of investment in infrastructure remain relatively limited, considering the large pool of available capital[9]. This puzzle of under-investment in the face of capital availability suggests that other factors are likely holding investor returns too low in many infrastructure markets (Blundell-Wignall and Roulet, 2015). Therefore, identifying and understanding potential market and government failures that may be contributing to this under-investment remains a central challenge in order for governments to effectively mobilise further private investment into domestic infrastructure markets.

National and Multilateral Development Banks and bilateral DFIs could play a critical role in supporting the move from 'billions to trillions', particularly in developing countries. In the current context of low interest rates and ample liquidity a key element of public sector intervention is the additionality of the projects supported, making sure not to crowd out private sector and addressing only sub-optimal investment situations and market gaps[10]. Evaluating the exact magnitude and significance of the impact of

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[2] G20 Global Infrastructure Connectivity Alliance

[3] G7 Ise-Shima Principles for promoting quality infrastructure investment

[4] Does infrastructure investment lead to economic growth or economic fragility? Evidence from China, Atif Ansar and alii, Oxford Review of Economy Policy, volume 32, Number 3, 2016

[5] OECD, All on Board, making inclusive growth happen, https://www.oecd.org/inclusive-growth/All-on-Board-Making-Inclusive-Growth-Happen.pdf

[6] OECD report on "Investing in Climate, Investing in Growth" 2017

[7] In developing Asia, it is expected that the private sector will need to account for large part of the total $26 trillion in forecasted investment needs from 2016 to 2030 or $1.7 trillion per year

[8] See G20/OECD Guidance Note on Diversifying Instruments for Infrastructure and SMEs, endorsed by G20 Leaders in September 2016

[9] On average approx 1% for the funds is invested directly in infrastructure, see OECD (2017) Annual Survey of Large Pension Funds and Public Pension Reserve Funds

[10] For example for the Juncker Plan the key factors to assess the additionality of the EFSI (defined as EIB Special Activities, i.e. operations with a higher risk profile) are higher risk coverage including through subordination, exposure to specific risks – such as unproven technology and higher-risk counterparts – as well as investments in new cross-border infrastructures. For MDBs the gap between the economic/social and the commercial returns of a project resulting from positive externalities that the private sector cannot capture is at the basis of MDBs interventions. When such a gap is particularly wide (e.g., infrastructure services for poor consumers, innovative clean energy technologies, etc.), a mix of public and concessional finance can be deployed, and targeted subsidies considered.

a particular type of infrastructure on economic outcomes can be of interest for multilateral development agencies and donors targeting investment in infrastructure projects in developing countries and ensuring additionality in policy interventions.

Improving the availability and quality of data and information on infrastructure investments, along with better disclosure of climate change risks, could support a more diversified and innovative financing of sustainable/quality infrastructure, and also broaden its appeal to a larger base of investors (i.e. institutional investors and banks). Data on these factors can inform financial analysis of risks and opportunities (e.g. in relation to prudential regulation or climate change), or serve as input for macro-level analysis of trends and developments. Governments can also make use of this data for decision-making, for instance for evaluating the costs and benefits of interventions.

G20 Work on Data Gaps for Long Term Investment

In light of the above, G20 Leaders have called for more empirical information to help guide their efforts to lift policy bottlenecks on both sides of the 'infrastructure investment equation' – as regards infrastructure financing on one side, and the enabling environment for investment on the other. Agreed actions under the G20 Global Infrastructure Initiative include addressing key data gaps that matter to investors – promoting infrastructure as an asset class[11] - and developing a knowledge-sharing network to aggregate and share information on infrastructure projects and financing (see box 1).

Despite the growing interest from investors and need for private infrastructure investments, there are only a limited number of empirical studies on the investment characteristics of this alternative asset class. To address this point the FSB, IMF, OECD and World Bank initiated a project in 2014 to develop a set of key quantitative indicators for long-term investment finance; see FSB et al (2014). In the G20 context, the OECD followed up on the project's recommendations, in cooperation with other countries and international organisations (IOs), e.g. Canada, Italy and the BIS; see OECD (2015)[12].

The **G20/OECD Task Force on Institutional Investors and Long-term Financing** (the "G20/OECD Taskforce") held two Workshops on Infrastructure as an Asset Class and Data Collection for Long-term Investment on 2 November and 10 May 2017 to address the above-outlined issue. The workshops were open to Task Force members (G20, OECD, Asian Pacific Economic Cooperation (APEC), Financial Stability Board (FSB) and International Organisations (IOs) such as the World Bank Group (WBG), the Global Infrastructure Hub (GIH) and the European Investment Bank (EIB)) as well as to selected private sector representatives from the OECD Network on Long Term Investment[13]. The events built on joint work of the OECD Directorate for Financial and Enterprise Affairs and the OECD Statistics Directorate and included interventions from the OECD Secretariat, the International Transport Forum, industry experts and invited academics. In line with G20 objectives and policy action, the thematic focus of the workshops was set on data issues related to the promotion of the financing of long-term infrastructure investment and the necessity to establish financial and ESG infrastructure investment benchmarks to make the asset class more accessible to private investors[14].

The discussions at both workshops recognised that there is great need for more analysis on long-term investment. However, especially when it comes to the drivers and impediments of investments in

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[11] See Communiqué Meeting of Finance Ministers and Central Bank Governors – Shanghai, 27 February 2016

[12] OECD (2015) "Addressing Data Gaps in Long Term Investment: an Agenda for Research" developed in cooperation with other countries an international organisations for the G20 (e.g. Canada, Italy and the BIS) and FSB, IMF, OECD, WBG (2014),"Development of quantitative indicators of long-term investment finance".

[13] This Network part of the OECD Long Term Investment project includes industry participants (investors, banks, corporates) academics and NGOs [see www.oecd.org/finance/lti].

[14] See summary of Workshop on 10 May; with the summary of the November Workshop forthcoming as part of the OECD report on "*Supporting the Infrastructure Data Initiative – Aggregating Data and Developing Performance Benchmarks for Infrastructure as an Asset Class*" (forthcoming), with the event page available at: http://www.oecd.org/daf/fin/private-pensions/lti-workshop-sustainable-infra.htm. .

infrastructure, there is a need to resort to fully-fledged multivariate econometric analyses and micro-based data in order to separately identify demand and supply factors. This need is the result of the analytical challenges linked to assessing investment financing through national accounts. Actual trends in long-term investment financing are the combined effect of several factors such as: the business cycle, capital expenditures, corporate credit risk, investors' risk aversion, banks' propensity to lend and funding conditions, regulatory developments, etc.

The workshops also stressed the importance of using micro-data (at firm/project level) for long term financing, pointing towards the development of new datasets, and acknowledging the opportunity for a collective action driven by the private and public sector's common interests. The discussion recognised that several policy and industry initiatives have been launched to try to get a better understanding of infrastructure at the macro and micro level. Taken together, all of these data sources and methods may be applied to help closing the data gap in infrastructure. However, many efforts are still needed, specifically at the micro level, with a potentially leading role for the G20.

At the workshops, also a new project, the "**Infrastructure Data Initiative**", was launched to address the issue of establishing infrastructure as an asset class through data collection and improving the availability of infrastructure investment data. This joint initiative by the European Investment Bank, Global Infrastructure Hub, Long-term Infrastructure Investors Association, OECD and the Club of Long Term Investors aims to create a centralised repository on historical long-term data on infrastructure at an asset level. The Task Force mandated the OECD to develop a plan for the creation of a preferred template of information for gathering financial and non-financial data (i.e. qualitative information that captures social and environmental dimension) on infrastructure projects. The detailed objectives of the Infrastructure Data Initiative are further outlined in the complementary OECD note on "*Supporting the Infrastructure Data Initiative – Aggregating Data and Developing Performance Benchmarks for Infrastructure as an Asset Class*" (forthcoming), which also includes a detailed summary of the OECD Workshop on 'Infrastructure as an Asset Class and Data Collection for Long-term Investment', held on 2 November 2017[15].

The initiative stresses in particular the importance of using micro-data (at firm/project level) for long term financing, pointing towards the development of new datasets, and acknowledging the opportunity for a collective action driven by the private and public sector's common interests. The discussion recognised that several policy and industry initiatives have been launched to try to get a better understanding of infrastructure at the macro and micro level. Taken together, all of these data sources and methods may be applied to help close the data gap in infrastructure. However, many efforts are still needed, specifically at the micro level, with a potentially leading role for the G20.

The OECD also hosted the OECD LTIIA Joint Forum on Developing Infrastructure as an Asset Class on 18 October 2017. The event brought together over 160 private sector stakeholders, policy experts, academics and government officials, representing institutional investors, such as pension funds and insurance companies, governments, banks, advisory firms as well as industry associations and think tanks from around the world. The discussions focused on enhancing public and private cooperation in infrastructure financing, shed light on current challenges and opportunities for public and private stakeholders in infrastructure investment and called for better analysis of infrastructure investment data as well as the establishment of meaningful financial and ESG benchmarks.

The Joint LTIIA and OECD Forum yielded especially a better understanding about the fact that currently, investors are in particular concerned with increasing levels of political and regulatory risks, which increase risk discount rates applied in financial modelling, as well as about rapid technological disruption and demographic trends that effect the way infrastructure is designed and financed. And even though these risks urge investors into the diversification of their portfolios, such as into smaller-scale and social infrastructure, the diversification into emerging market infrastructure projects is yet not yet very

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[15] See event page for more information at http://www.oecd.org/daf/fin/private-pensions/lti-workshop-sustainable-infra.htm

attractive, although greatly needed to advance the global development agenda. Ultimately, the discussions among investors and industry experts also acknowledge that ESG performance and the financial performance of an infrastructure project are highly interconnected and that ESG consideration are increasingly important to capital allocation decisions, both among investors as well as beneficiaries. Overall, these discussions underlined the need to better understand the financial as well as environmental, social and governance performance of infrastructure investments and the need for financial and ESG performance data and benchmarks for private investors to understand and better access the infrastructure market[16].

Role of G20 and Suggested action

The G20 and the G20/OECD Taskforce could play a key role in helping to advance the agenda for research on data gaps in long-term investment supporting sustainable investment in infrastructure and developing infrastructure as an asset class. Among suggested actions to be considered by the Taskforce and relevant IOs:

- Explore scope for analysis building on available national account data especially in OECD countries (similar to the ones made by Canada and Italy) and leveraging other international initiatives as the G20 Data Gaps Initiative and data collection initiatives on a voluntary basis.

- Propose econometric analyses to identify demand and supply factors for long term finance for infrastructure (i.e. the business cycle, capital expenditures, corporate credit risk, investors' risk aversion, banks' propensity to lend and funding conditions, regulatory developments, etc.).

- Mapping level of investment and financing channels for infrastructure including listing instruments and levels of public financial support.

- Creation of a database of stock and flows of infrastructure project/firms at sector level using commercial databases.

- Mapping infrastructure investment risk that the private sector is facing, considering investment evaluations and pricing.

- Promote a definition of sustainable and quality infrastructure investment to facilitate data collection on sustainability and resilience factors in infrastructure investment.

- Promote standardisation and harmonisation of project documentation[17] and of approaches to infrastructure valuation and analysis.

- Promote international infrastructure data collection, with the adoption of a template for a preferred set of information to be collected (macro and micro level), including quantitative data on historical cash flows and performance at the project level and qualitative data covering project characteristics and sustainability issues[18].

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[16] See the Summary Report as well as the event page for further information.

[17] Building on GIH PPP Risk matrix.

[18] Building on current work developed by GIH, EDHEC, EIB and the OECD, and on note circulated to the G20 in 2015 on Addressing Data Gaps in Long-term Investment. Also of relevance the new software on project preparation SOURCE

- Beyond tracking of financial flows, develop common measures of the economic and development impact of these flows[19].

- List governments and DFIs instruments and techniques to attract private sector financing in infrastructure (i.e. risk mitigation and blended finance).

- Create a framework on qualitative and quantitative factors to help governments' stock taking of instruments available and better evaluate their performance.

- Promote the setting of objectives for the use of National Development Banks (NDBs) and Multi-lateral development banks (MDBs) balance sheets to catalyse private investment, taking also into consideration compliance issues related social safeguards..

- Define measurements and criteria to assess the impact of initiatives that leverage private sector capital in infrastructure.

- Promote collaboration among public and private stakeholders to better understand the needs for infrastructure investment regulation.

- Monitor and promote a better understanding of the effects of policy events on the performance of infrastructure investments and support investors in building more resilient portfolios.

- Increase the efficiency of existing ESG standards, bridge gaps between them and improve investors' understanding of non-financial ESG factors.

- Increase ambitions in the field of blended finance to support emerging market investments and support international effort in providing local authorities with more technical assistance as well as in reducing transaction and delivery costs for infrastructure project development.

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[19] By coordinating measurement and reporting across governments, the private sector and development finance institution (DFIs), transparency and accountability will be increased addressing unintended consequences in regulation, while potential gaps and opportunities for private sector will be identified.

Box 1: Key G20 initiatives Addressing Data Challenges for Long Term Finance

G20 Finance Ministers gathering in Shanghai in February 2016 stressed the importance of **promoting infrastructure investments as an asset class**. The infrastructure sector has experienced a steady rise of investor interest over the past decade with new investors such as pension and private equity funds and insurance companies starting allocations to this relatively new alternative asset class. Promoting the development of infrastructure as an asset class, improving data and information to support more diversified and innovative financing of infrastructure, has been one of the main priorities of the **G20/OECD Taskforce on Institutional Investors and Long Term Investment Financing**. In 2016, in close collaboration with the WBG, IMF and other IOs, the Taskforce has developed the G20/OECD Guidance Note on Diversification of Financial Instruments for Infrastructure and SMEs, endorsed by G20 Leaders in September 2016, building on the G20/OECD High Level Principles on Institutional Investors and Long Term Financing.

The implementation of the second phase of the *G20 Data Gaps Initiative[20]* is underway - strongly supported by the *G20 International Financial Architecture Working Group IFA-* which aims to address gaps identified in the global financial crisis by enhancing the collection and dissemination of reliable and timely statistics for policy use. Within this Initiative, specific recommendations to G20 members and other participating economies to enhance sharing of granular data at national and international level (e.g. through common identifiers as well as by revisiting, as appropriate, confidentiality rules and legal frameworks) were agreed in a G20 DGI workshop and welcomed by the G20 in March 2017. The IFA Working Group is particularly interested in information that would support a better understanding of capital flows and private sector borrowing. The initiative's defined target is 2021; however, much progress was already accomplished by countries as illustrated by the discussions during the G20/OECD Workshop on Data gaps[21].

The G20 is also currently attempting to address the question of the effective adoption of Environmental Risk Assessment (ERA) practices that aim at translating **environmental factors into financial risks** through the *G20 Green Finance Study Group (GFSG)[22]*. The GFSG identified appropriate indicators and addressing data gaps as a fundamental pre-requisite to its vision of Green Capital Mobilisation. In particular, it calls for the improvement of "the availability and usefulness of publicly available environmental data for financial analysis"[23] (PAED). The work on PAED[24] is complementary to the one undertaken by the FSB on corporate-level financial disclosure of climate-related information. It intends to help in the assessment of the probability and impact of transition and physical risks as well as the identification of green financial opportunities. In order to enhance the access to PAED and reduce search costs, UN Environment and the OECD were invited to prepare a *Catalogue of Publically Available Environmental Data*.

As part of the billion to trillions commitment an enhanced focus on crowding-in commercial finance has been reaffirmed through the **Principles of MDBs Strategy for Crowding in Private Sector Finance for Growth and Sustainable Development[25],** highlighting commitment of G20 member countries and the MDBs to foster effective approaches to maximize the mobilization and catalyzation of private sector resources to support countries with the implementation of the 2030 Development Agenda. Given the unique value added of MDBs in advancing the post-2015 agenda, the G20 is committed to using these institutions to their full potential. As stated in the **MDBs Action Plan to Optimize Balance Sheets[26]**: Fully utilizing MDBs requires shareholders to advance voice and capital discussions, to ensure that the institutions are properly capitalized with shareholdings reflective of the distribution of the global economy. It also requires that limited MDB capital resources are used as efficiently as possible. To advance the efficiency side of this agenda, the G20 began calling on MDBs to work through their Boards to optimize balance sheets, in order to increase lending without substantially increasing risks or damaging credit ratings.

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[20] The initiative was launched in 2009 by the G20 Finance Ministers and Central Bank Governors (FMCBG) and its supported by Financial Stability Board (FSB) , the International Monetary Fund (IMF), World Bank, UN, BIS, Eurostat, ECB and the OECD. See Annual FSB Report on G20 Activities 2017

[21] See Summary of Discussion of G20/OECD Workshop on Data Gaps.

[22] Bank of England, UN Environment Inquiry, and University of Cambridge Institute for Sustainability Leadership (2017) *"Enhancing Environmental Risk Assessment in Financial Decision-Making"* a background paper developed in support of the G20 Green Finance Study Group.

[23] China Green Finance Committee and UN Environment Inquiry (2017) "*Improving the availability and usefulness of publically available environmental data for financial analysis"* a background paper developed in support of the G20 Green Finance Study Group.

[24] Defined in the GFSG background paper on "Improving the availability and usefulness of publicly available environmental data for financial analysis" as "*environmental data that are reported by non-corporate entities, such as government agencies, international organizations, non-governmental organisations and science institutes, and that are useful for financial analysis".*

[25] G20 – IFA WG Principles of MDBs' strategy for crowding-in Private Sector Finance for growth and sustainable development April 2017

[26] Multilateral Development Banks Action Plan to Optimize Balance Sheets

AREAS OF WORK – AN AGENDA FOR RESEARCH

This section is intended to support the discussions surrounding the types of measures and data collection efforts that could help bridging the data gap in infrastructure, and propose an agenda for research concerning several stakeholders (i.e. governments, development community, private investors) in order to foster the development of infrastructure as an asset class. The section's primary focus is on understanding the role private sector financing can play in meeting the infrastructure investment needs, as well as identifying the policies that will the mobilisation of private sector financing at the necessary scale.

Three main streams of work have been identified:

I. **Mapping the Financing and Risk Allocation in Infrastructure**: Measuring the level of investment is necessary for a greater involvement of the private sector in infrastructure which is in turn essential to meet the infrastructure needs, ensure a better allocation of risks, and introduce a more efficient and competitive market structure. As financial market can support infrastructure in various ways, the challenge of mobilizing greater private sector financing for infrastructure implies a better understanding of the relationship between the participants in infrastructure financing.

II. **Infrastructure as an Asset Class - investment characteristics**: The availability of reliable data and information at project/firm level is of a paramount importance in order to encourage institutional investors' participation in infrastructure financing. Encouraging more transparency in infrastructure assets' pricing and risks allows investors to make a better informed evaluation of risk and returns opportunities. It also requires a better understanding of the role of infrastructure in institutional investors' strategic asset allocation and asset and liability process, as well as the extent to which the asset class could meet other objectives such as liability-driven investment or the enhancement of the asset owners' governance and alignment of interest.

III. **Mobilising private sector investment in developing countries:** In order to attract private sector financing to developing countries better measurement and tracking of flows is needed with the design of new financial instruments and forms of collaborations with traditional sources of capital. DFIs, NDBs and MDBs will have a major role in catalysing private participation in infrastructure and several initiative on the measurement of this mobilization effort have been launched.

I. Mapping the Financing and Risk Allocation in Infrastructure

The recent shift towards greater involvement of the private sector in the delivery and financing of infrastructure is reflecting budgetary constraints on the public side and a desire to introduce more competitive and efficient market structures. The use of private capital is intended to **transfer some risks** from the public to the private sector and provide other commercial benefits to offset the higher cost of private capital. The **allocation of risks** between private parties and governments will impact the optimal equity and debt financing mix and consequently the cost of capital (OECD, 2001, OECD 2007).

Financial markets support the infrastructure sector through a variety of investors (e.g. utilities, banks or institutional investors) and asset classes (such as debt, equity or mezzanine). Different types of private funding models imply different capital structures for infrastructure and the specific role for investors. Understanding the relationship between traditional sources of finance and capital markets is critical.

Government decisions on financing should aim to minimise costs, including contingent liabilities and transaction costs, ensure the affordability and robustness of the financing structure (i.e. level of fees and leverage) as well as the sustainability of the financing over the long term, making sure that incentives are aligned among the stakeholders.

Areas of research

Advancing the dialogue on the subject of measuring investment and financing in infrastructure will address the following primary areas:

- **How much private investment goes into infrastructure? What is the level of foreign participation? The infrastructure market:** Attempts at quantifying the future size of the infrastructure market depend on how assets will be made available for private investment. The public sector ultimately needs to decide whether or not to finance and build infrastructure itself by hiring outside contractors (the traditional procurement model) or by delegating part of the risk to the private sector who invest in infrastructure delivery (Blanc-Brude 2013a). Understanding the importance of private sources of infrastructure will define the investable part of the infrastructure - physical assets that generate cash flows from external users – of relevance in an asset allocation context.

- **What are the trends in financing infrastructure? Role of different private sectors (corporates, banks and institutional investors) and public sector development banks and finance institutions:** Business and financing models used to attract private capital in different infrastructure sectors. An analysis of the various funding and investment vehicles is carried out with a snapshot of the growth experienced in the market in specific infrastructure sectors (i.e. renewable sector). Such a work would potentially explore the role of different private actors (corporates, banks and institutional investors), and specialised public sector development banks and finance institutions, with a focus on their potential to scale up and mobilise investment.

- **Mobilising resources and mitigating risks - traditional investors and new sources of commercial financing for development.** The analysis of diversified sources of finance for infrastructure aims to provide the foundation for the identification of effective delivery models and financing approaches that could broaden the financing options available for infrastructure projects and increase as well as diversify the investor base. This also has the potential to lower the cost of funding and increase the availability of financing in infrastructure sectors or regions where financing gaps might exist. Effective contractual arrangements through different forms of PPPs align the service delivery objectives of the government with the private sector's objectives to generate profits at an expected level of risk.

- **What are the risks in Infrastructure Investment and financing? Optimal allocation of Risk and alignment of financial market policies**: Risks in Infrastructure and Impact on Capital structure: In order to understand how well placed the government and/or private partners are to manage infrastructure assets, an important consideration relates to the nature and magnitude of the risks associated with infrastructure. Also as risks vary across the life of the project also important is to understand how this impact the capital structure and financial instruments and techniques for infrastructure procurement

The following actions may be considered:

- **Mapping investment and financing channels for infrastructure:** Using commercial databases, it is possible to map the financing of infrastructure at sector level describing major trends and the different roles of private sectors and sources of finance that could support investment across different phases of a project. Building a link between the financing trends and the delivery models of infrastructure projects allow to better understand the drivers and barriers behind the dynamics of infrastructure investment. Such work would take into consideration the nature of investment (greenfield/brownfield, domestic/foreign) and relevant financing and funding mechanisms. It includes an analysis of channels of debt/equity financing, secondary markets, and an analysis of the   capacity of corporations (including public utilities and state-owned enterprises (SOEs)) to invest equity and debt capital in infrastructure projects.

- **Listing instruments and levels of public financial support** (aside from where the money comes from) and sources of cost recovery – how will the project be repaid (users charges, commercial revenue, other hypothecated sources (e.g. fuel tax), public budget). These measures should be tracked periodically (e.g. every 3 years) to see how the projects are evolving (public support may change from year 1 plan, including cost recovery patterns, which gives feedback on risks that materialized to some extent).

- **Creating a database of stock and flows of infrastructure project**s at sector level. A direct output would be a database for public and private investments in infrastructure investment that could help, at a first stage, to identify the stock and flow of infrastructure projects at sector level.

- **Developing measures of information on investment and finance** at the macro- and meso- level and micro level, for infrastructure investment and financing, with the involvement of relevant international organisations and national statistical authorities.

Reference Work

The OECD Secretariat introduced recent analysis in the context of G20, on Mobilising financing for the transition, mapping of financing of low carbon infrastructure focusing on energy, transport and the renewable sectors[27]. Using commercial databases, this work describes major trends in private financing for infrastructure and the different roles of private sectors and sources of finance that could support low carbon infrastructure across different phases (greenfield vs brownfield). It also examines the major factors hindering and helping private investment and sets out a range of instruments and transaction enablers that can be deployed to mobilize private finance. This builds on the OECD Taxonomy of Infrastructure Financing Channels[28], linking the role of the private sector in infrastructure to the financing structure used in each sector (project vs corporate), the delivery models and

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[27] OECD (2017) "Mobilising financing for the transition" Chapter 7 of the report "*Investing in Climate, Investing in Growth*" launched 23rd May 2017, Berlin www.oecd.org/environment/cc/g20-climate/)

[28] See OECD (2015) A Taxonomy: Infrastructure financing instruments and incentives   and G20/OECD Guidance Note on Diversification of Financial Instruments for Infrastructure and SMEs, endorsed by G20 Leaders, September 2016

governance of infrastructure (Public-Private Partnerships (PPPs) vs non-PPPs), and finally the financing mix (debt vs equity).

OECD-led Research Collaborative on Tracking Private Climate Finance is also tracking private climate finance, together with flows of public finance, in an effort aiming at monitoring the international actions to address climate change. It is a network of governments, research institutions and international finance institutions partnering to share best available data and information, and identify gaps and priorities.

The IEA 2017 World Energy Investment (WEI) quantifies in a comprehensive manner investment in the energy sector across technologies, sectors and regions. In addition to tracking investment in physical infrastructure, WEI 2017 describes how the different sources of capital are evolving and assesses the role of other financial transactions, such as mergers and acquisitions and refinancing.

The OECD/ITF report on Quantifying private and foreign investment in transport infrastructure data (see DAF/INV(2015)/REV1) aims to quantify investment using project-level by sub-sectors in 111 economies from 1995 to 2014. It yields a number of interesting observations on how domestic and foreign investment has been channelled into transport infrastructure in OECD and non-OECD countries. This is part of a larger project that aims to better understand the enabling conditions for investments in infrastructure and their broader economic outcomes, including inter alia its effects on countries insertion into global value chains.

In its 2015 report on 'Financing Infrastructure in Latin America and the Caribbean: How, How much and by Whom?', the Inter-American Development Bank (IDB) sheds light on potential sources of infrastructure investment in Latin America and the Caribbean. It therefore examines not only how much investment in infrastructure investment in the LAC region is currently undertaken, but also analyses the sources of these investments as well as the investment instruments that are being used. It in particular focuses on identifying approaches and vehicles on how underinvestment in infrastructure in LAC can be addressed and how more private investors can be attracted to the market.

The IOSCO (International Organization of Securities Commissions) research note on 'Market-Based Long-Term Financing Solutions for SMES and Infrastructure' (2015) examines case studies of capital market solutions that have contributed to the financing of SMEs and infrastructure projects. It reviewed numerous market-based financing projects, both in emerging and developed markets, in order to assess possible solutions to increase private investor engagement in infrastructure financing. It focused in particular on innovative structures and products in the areas of equity, debt, securitization and pooled investment vehicles.

Other OECD work also analysed the effects of government policies on flows of private finance for investment in renewable energy (inducement effect). It also examines whether direct provision of public finance for a project increases the volume of private finance raised ("crowding in" effect). A unique dataset of financial transactions for renewable energy projects with worldwide coverage is constructed using the Bloomberg New Energy Finance database. The analysis covers 87 countries, six renewable energy sectors (wind, solar, biomass, small hydropower, marine and geothermal) and the 2000-2011 time-span. Source Inducing Private Finance for Renewable Energy Projects: Evidence from Micro- Data", OECD Environment Working Papers, No. 67, OECD

II. Infrastructure as an asset class - investment characteristics

Over the past decade institutional investors, such as pension funds, insurers and sovereign wealth funds, have been looking for new sources of long-term, inflation protected returns. Asset allocation trends show gradual globalisation of portfolios, with increased interest in emerging markets and diversification into new asset classes. Increasing numbers of institutional investors are recognising the potential for infrastructure investment to deliver inflation-linked, long-term and stable cash flows. Despite these encouraging trends, total amounts of institutional investment in infrastructure remain relatively limited, considering the large pool of available capital from long-term investors. A growing number of investors are concerned with the potential impact of climate change on their long-term financial performance, integrating ESG considerations into their investment processes[29].

Private investors approaching infrastructure are facing an "information gap". There seems to be a disconnect between the investment narrative – a series of intuitions drawn from economics – and the observed performance of available investment products, due to a lack of clarity of relevant assets related to the relative novelty of the asset class and a lack of empirical evidence on the investment characteristics. Besides financiers, operators as well as governments and regulators have a genuine interest in the investment characteristics of the assets that they manage, privatise, or regulate. Since resource-constrained governments are unlikely to provide sufficient finance for the massive infrastructure requirements, they need to institute conducive policies of regulatory independence and effective risk mitigation mechanisms.

Areas of research

In order to encourage higher levels of investment in infrastructure by institutional investors, improved data and information are necessary. Encouraging a competitive market where pricing and associated risks in infrastructure assets are transparent allows investors to evaluate the risk/return opportunities with enough confidence to make well informed investment decisions. Advancing the dialogue on the subject of infrastructure as an asset class will address four primary areas:

- **How are Institutional Investors approaching infrastructure investment? How much is invested by pension funds, insurers and SWFs? The investment mandate ambiguity**: Describing with strong empirical evidence the role of infrastructure investments in the asset allocation process, and integrating infrastructure assets into the asset/liability investment framework. Placing infrastructure assets in a "real asset" category conceptually fits the purported properties of infrastructure, however; a closer look at expected performance and a clearer understanding of these expectations is warranted in order to reduce the risk of asset allocation errors and misspecifications. Additionally, regardless of strategic asset allocation objectives, infrastructure may have a role in meeting liability-driven investment objectives. A strong infrastructure investment mandate can also improve asset/owner governance and alignment of interests.

- **What are the risk and returns of infrastructure assets? Benchmarking and success metrics for infrastructure investment:** Observing performance of the infrastructure investment universe, and constructing benchmarks based on historical returns creates inputs into the asset allocation process, and permits the evaluation of long-term objectives through the definition of success metrics. From a regulatory point of view, the difference in financial structure (corporate vs project) and the changing risk level profile across different phases (greenfield vs brownfield) are particularly important in the recalibration of risk weights for

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[29] As highlight by the OECD's report on "*Investment Governance and The Integration of ESG Factors*" (2017), evidence suggests that ESG factors may have a material financial impact and therefore should be relevant to institutional investors as they build their portfolios. However, the lack of standardisation and ESG data on infrastructure assets limits the ability to explore the link between the ESG performance and the financial performance.

prudential regulation. The regulation being one of the drivers of infrastructure financing of banks and institutional investors (i.e. Basel and Solvency)[30].

- **How to align investors to long term assets? What are the products needed? The principal/agent problems and asymmetric information:** Infrastructure projects and vehicles tend to lack transparency due to opaque and diverse structures and delivery models (i.e. PPPs). The information required by investors to assess these risk-structures and the infrastructure market in general is lacking or highly scattered, creating uncertainty. The limited availability of instruments is not often matching the appetite for risk, long term horizon and governance requirement of long term investors such as pension funds and insurers. In cases where agents (such as investment managers) act on behalf of investors, aligning investor interests with managers' requires access to data in order to complete the manager selection process, to select appropriate investment products, and to properly monitor managers.

- **How to incorporate sustainability criteria in infrastructure investment? What is the impact of Climate Change? Sustainable investment**: Such work can shed light on ESG criteria in infrastructure investment, and provide valuable analysis on clean energy projects and green infrastructure. Sustainability is an emerging theme in institutional investment and infrastructure investment. Investors are increasingly factoring ESG criteria into investment decision and risk management processes. Given their usually large scale and long-term nature, as well as the involvement of many public and private stakeholders, infrastructure assets can be exposed to a series of environmental, social and regulatory risks (i.e. transition risk[31]). While the definition of "sustainable infrastructure" varies between investors and can include for example clean energy projects or social housing, the idea that governance practices and environmental considerations affect long-term risk is today widely accepted. Transparent parameters allowing for adequate monitoring of ESG performance is also important.

The following actions may be considered:

- **Promote a definition of sustainable and quality infrastructure investment** to facilitate data collection on sustainability and resilience factors in infrastructure investment. Structure high quality investment projects, developing a definition of quality infrastructure and a commercially viable pipeline of projects, including PPPs. Promoting a definition of sustainable quality infrastructure investment will facilitate data collection on performance measurement, sustainability, and resiliency factors in infrastructure investment, helping to tackle the information gap investors are facing. At the same time promoting a bankable pipeline of projects through standardisation and harmonisation of project documentation will encourage private sector involvement in infrastructure.

- **Promote standardisation and harmonisation** of project documentation and disclosure[32] and of approaches to infrastructure valuation and analysis. Ideally, private operators should be asked to structure financial models in a simple and accessible way in order to make bids comparable, as sometimes financial models are hardly accessible even to corporate finance experts. This would help to limit the potential for moral hazard through increasing transparency, thereby helping to reduce the incentive to sculpt returns to investors in ways which hide the true magnitude of return. If, for example, tender documents outlined rules to be

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[30] Recently, in November 2016, the European Commission has proposed to reduce capital charges for insurers and banks investing and lending to certain infrastructure investments.

[31] Transition risk, also referred to as carbon risk, is the financial risk rising from the scale and speed of the changes required by the transition to a low carbon economy (TCFD, 2016).

[32] Building on GI Hub's PPP Risk matrix.

followed by private operators in preparing financial models, the magnitude of information asymmetry (and related transaction cost) could be reduced.

- **Promote international infrastructure data collection**, with the adoption of a template for a preferred set of information to be collected (macro and micro level), including quantitative data on historical cash flows and performance at the project level and qualitative data covering project characteristics and sustainability issues[33].

- **Support initiatives to create infrastructure benchmarks which will in turn help to describe infrastructure as an asset class.**

Reference work

The OECD launched in 2012 a project which aims to facilitate long term investment by institutional investors such as pension funds, insurance companies and SWFs addressing both potential regulatory obstacles and market failures. As part of this project regular annual surveys of pension funds and insurers are conducted

GIH Project Pipeline: in 2016, the GIH launched its project, an online platform to provide the private sector with free information about government infrastructure projects across the world. The portal provides early stage visibility of potential projects and then tracks projects as they progress through their lifecycle from conception to operation. Australia, China, Colombia, Korea, Mexico, New Zealand, and Uruguay are participating in the GIH Project Pipeline, with some of their major infrastructure projects already on the online database. This enable the private sector to better evaluate project opportunities in public infrastructure across jurisdictions and markets. Importantly, the Pipeline also act as a marketing tool for the public sector, helping governments promote their infrastructure projects and programs.

SOURCE: SOURCE is an online cloud-based management tool that helps public sector agencies to improve their project preparation. Launched in January 2016, by the end of 2016, more than 100 projects were available on the platform. IISS offers several advantages to the private sector including visibility on public sponsors during the development phase and projects requiring finance; a view on the timetables of the projects; the ability to follow developments in different markets and to compare investment alternatives.

The European Investment Project Portal: the EIPP is an online portal established by the European Commission under the Investment Plan for Europe. The EIPP enables EU-based private and public project promoters to provide information about their investment projects and increase their visibility to investors.

Standardisation of project documentation could potentially help to decrease overall costs and could increase project viability. While PPP transactions will always require some degree of asset-specific customisation, a general template for structuring PPP contracts should reduce the cost and complexity of executing a PPP transaction and facilitate broader investor involvement. Recent initiatives such as the GIH PPP Risk Allocation Matrix, aim to develop template contracts for PPPs in order to facilitate private sector involvement.[34] China: The government has improved the PPP operating guidelines to provide full cycle regulation for operating procedures from project identification, preparation, procurement, execution to handover. The contract guidance and the standardized contracts for different industries and sectors have also been formulated

European Financial Services Roundtable (EFR): The EFR supports the notion that standardizing disclosure and reporting requirements for infrastructure investments would support the establishment of infrastructure as an asset class and increase the accessibility of infrastructure investments to private investors. The EFR has thus developed a framework and standard template for disclosure and reporting requirements, including debt term and documentation requirements, which aims to increase transparency in the market and harmonise project pipelines, structures, financing and reporting.

Terrawatt Initiative: Together with the International Renewable Energy Agency (IRENA), TWI has launched the Global Solar Energy Standardisation Initiative which aims to design and draft a comprehensive set of open source contracts and guidelines to reduce development time and costs of transaction that weigh heavily on the competitiveness of renewable projects, starting first with an initial focus on solar energy specifically. The key objective of the initiative is thus to produce a bankable, cost-oriented and easy-to-implement set of documentation, ensuring a balanced and fair risk-allocation throughout

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[33] Building on current work developed by GIH, EDHEC and the OECD, and on note circulated to the G20 in 2015 on Addressing Data Gaps in Long-term Investment.

[34] UNECE and PPIAF have also produced work relevant for the standardisation of PPPSs.

the value chain of solar projects, to further promote the deployment of solar projects and investment around the globe. The Initiative brings together a large group of public and private sector key experts within the industry (covering financing, development, supplier, insurance and legal expertise etc.), which together define and agree on the core terms for the standard documentation needed, to set a global quality benchmarks and standards for the solar industry.

US: A working group set up by the Treasury has recently recognised that the absence of an infrastructure return benchmark or index reduces the investment community's ability to evaluate PPPs. It was recommended that the Department of the Treasury convenes financial data providers and infrastructure market participants to explore the possibility of developing a U.S.-centric infrastructure return index for one or more sectors.

Many international standards, such the Global Infrastructure Basel's SuRe, have been developed in order to integrate sustainability and resilience aspects into infrastructure development and upgrade. In addition to the project-focused tools such as SuRe, initiatives such as GRESB address infrastructure sustainability issues at the asset and the fund levels. In practice, GRESB provides a tool coupled with a scoring methodology that assesses ESG performance of assets in line with international standards such as PRI standards.

Transition risk, also refer to as carbon risk, is the financial risk rising from the scale and speed of the changes required by the transition to a low carbon economy (TCFD, 2016). The World Resource Institute (WRI) and UNEP FI (2015), as well as the Energy Transition Consortium led by the 2 Degrees Investing Initiative, suggest approaches and challenges to assess transition risk. For instance, the Energy Transition Consortium (2016) highlights the difficulty to link ownership data, at a company level, to the assets. Making the link is not always possible using the financial databases in the market. Data can be located in different platforms and the effort to aggregate it could be a deterrent to the analysis.

III. Mobilizing private sector investment in Developing Countries

Great effort will be needed to in order to promote infrastructure and support the implementation of the SDGs, including actions by MDBs to **catalyse larger amounts of capital from private investors, and in particular institutional investors**[35]. The MDBs drive their efforts to crowd-in greater levels of private sector investment via co-financing, mobilization, and catalytic mechanisms. However, despite increasing interest, total amounts of institutional investment in infrastructure remain relatively limited, considering the large pool of available capital from long-term investors[36].

As many fiscally constrained governments seek greater levels of private finance in infrastructure, there is a growing need to leverage private financing and "blend" scarce public money with private resources through various instruments (investment grants, interest subsidies, first-loss guarantees). Governments focalise there effort on being more innovative in the way they fund projects, using new financial instruments and techniques, and optimising risk allocation amongst the respective stakeholders. This is particularly important in developing economies where investment is sometimes further hindered by weak policy frameworks and governance.

Areas of research

- **Tracking mobilization of private sector financing**: measuring the volume of private finance mobilised by official development finance interventions and MDBs on a consistent basis, applying common definitions for a range of development priorities, including climate change and infrastructure

- **How to crowd-in private sector financing ensuring additionality and value for money?** How does public sector intervention through mitigation techniques and incentives factor into this assessment? How to price market interventions which involve public authorities assuming project risks to adequately reflect the risk to the taxpayers? Projects that have a greater degree of revenue risks, operating risks, or construction risks that limit the capacity to borrow capital may face financing gaps and may need public support.

- **Developing, expanding and standardize new risk-sharing instruments and financial products** in the form of guarantees, insurance products, blended finance, equity investment, and liquidity backup facilities to enhance opportunities for private support of public objectives. To help channel international and domestic substantial institutional investor savings into productive infrastructure investment the development of new financial products is needed to match investors' return expectations and liability structures. Blending supports a variety of risk mitigation techniques including via guarantees, insurance and hedging, as well as syndication, and debt subordination

The following actions may be considered:

- **Define measurements and criteria to assess the impact of initiatives that leverage private sector capital in infrastructure**, developing a harmonized approach to leveraging private sector resources and additionality, in order to ensure higher consistency in project selection while mitigating potential reputational risks. This would include a common framework to identify

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[35] How private resources could best be mobilised for financing development are at the heart of the debate on development finance. See MDB/IMF (2015) 'From Billions to Trillions; Transforming Development Finance' prepared jointly by AfDB, ADB, EBRD, EIB, IDB, IMF and WBG prepared for the Third International Conference on Financing for Development in July 2015

[36] On average approx 1% for the funds is invested directly in infrastructure, see OECD (2017) Annual Survey of Large Pension Funds and Public Pension Reserve Funds

and track the value added of governments and DFIs investments with the private sector, with a view to crowding in private financing.

- **Measure governments' instruments and techniques to attract private sector financing in infrastructure** and creation of framework on qualitative and quantitative factors to help governments to take stock of instruments available and better evaluate their performance. Ultimately this will help institutions to adapt their business model to crowd in more private sector investment in infrastructure.

- **Promote the setting of objectives for using NDBs** (and MDBs through countries participation in their governance) balance sheets to catalyse private investment, taking also into consideration compliance issues related social safeguards etc;

Reference Work

The DAC has been working on measuring the volume of private finance mobilised by official development finance interventions. This work is carried out in consultation with multilateral and bilateral development finance institutions, as well as in close collaboration with the OECD-led Research Collaborative on tracking private climate finance. It is also expected to contribute to the ongoing development of a broader measurement framework of total official support for sustainable development (TOSSD) and the DAC work stream on blended finance. Following a series of surveys carried out since 2012 to pilot methodologies[37] for measuring mobilisation, the DAC has recently published the preliminary results of its 2016 Survey[38], covering two additional leveraging instruments/mechanisms: credit lines and direct investment in companies (DICs) (see annex 3)

This covers financial instruments to facilitate private investment and amounts mobilised for infrastructure (See Miyamoto, K & Chiofalo, E (2016) Official Development Finance for Infrastructure - With a Section on Multilateral Development Banks http://bit.ly/2gS7epu). There is also focus on particular regions such as Africa and Asia. Currently, there is on-going work to review ODF for regional (i.e. cross-border) transport, together with the Investment Committee Secretariat, in order to contribute to the World Bank's publication on Global Connectivity, with a view to its submission to the G20 in 2018.

The Development Cooperation Directorate is undertaking a work program in order to help scale up and mainstream Blended Finance by donors. Considerable private capital is looking to invest in developing countries but constrained by both perceived and real risks. Blended Finance instruments through the preparation of best practice policy guidance by DCD aims to ensure that projects which support development objectives can be funded and financed by domestic and international investors. The objective of the work programme is to support this public goal, firstly through the adoption of Blended Finance Principles, which donors can use as a framework for engaging on blended finance going forward.

The OECD building on earlier work and working in close collaboration with the WBG, IMF and other IOs, has developed a G20/OECD report on investment strategies and G20/OECD *Guidance Note on Diversification of Financial Instruments for Infrastructure and SMEs*. The OECD is also leading work on infrastructure financing for APEC, coordinating major deliverables for the current Vietnamese presidency, including a report on risk mitigation instruments and the use of PPPs working in close cooperation with Global Infrastructure Hub, ADB and other relevant IOs.

MDB Task Force on Measuring Private Investment Catalysation: In January 2016, the Heads of a group of MDBs[39] agreed to convene a Task Force to develop a joint framework and methodology to measure private investment catalyzed by the MDBs. The outcome of the Task Force will enable the MDBs to measure private investment catalyzed on a consistent basis, applying common definitions, and to report on their contributions to catalyzing private investment for a range of development priorities,

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[37] The methodologies follow a number of principles underpinning an international statistical system: to be realistic, feasible and avoid double-counting, the methodologies strive to be conservative (causality), fair (pro-rated attribution to all official actors) and pragmatic (point of measurement and data availability).

[38] See more results at: http://www.oecd.org/dac/stats/mobilisation.htm.

[39] African Development Bank, Asian Development Bank, Asian Infrastructure Investment Bank, European Bank for Reconstruction and Development, European Investment Bank, Inter-American Development Bank, International Finance Corporation , Islamic Development Bank, New Development Bank and the World Bank .

including climate change and infrastructure.

In a recent note on the evaluation of the **investment plan for Europe** (EFSI)[40] it is Addressed **the additionality** of EFSI support and mobilisation of private investment in the EFSI 2.0 proposal. Since its launch, the implemented and co-sponsored by the EIB , is firmly on track to deliver the objective of mobilising at least EUR 315 billion in additional investments in the real economy by mid-2018 while endeavouring to maximise private sector contributions. The evaluations conclude that the EFSI has been relevant in addressing investment needs in Europe. The independent evaluation points to the persistent investment gaps and market needs and concludes that the EFSI is contributing to closing that gap by addressing the need for high-risk financing.

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[40] Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions - investment plan for Europe: evaluations give evidence to support its reinforcement, November 2016

USE OF MICRO DATA FOR INFRASTRUCTURE ANALYSIS

Micro Data for Analytical Work

Official statistics produced by national statistical offices (NSOs) have traditionally focused on macro-based statistics and indicators, particularly in an international context. But as the world economy becomes more global, complex and diverse, comprehensive and good quality of micro-data has become an important tool for evidence-based decision making on complex issues. At the same time, rapid advances in computational capabilities have allowed for the processing of large databases of micro-data (See OECD 2010). However, a number of technical, legal and statistical constraints still hinder the international dissemination of official micro-data.

The creation and maintenance of databases gathering project and firm-level information across a wide range of countries has attracted a lot of attention in recent years; commercial databases are largely used within the business community and, more recently, by academic scholars. Micro-data are also increasingly used at the OECD not only for econometric analysis that aims at capturing the heterogeneity of economic actors but also for different and more detailed ways of data aggregation (e.g. by geographical unit, firm size, industry). Examples of micro-data analysis at the project/firm level include:

- *The measurement of productivity and its determinants.*
- *Innovation – identifying the characteristics of innovative firms and people (ICT, R&D) and their benefits.*
- *Globalisation – looking at whether multinationals are more efficient and productive than domestically owned firms, the types of businesses that have benefited most from globalisation or the role played by outsourcing.*
- *Impact evaluation and development economics.*

The increased use of micro data for analytical and policy purposes has three main drivers. The first is the progress and evolution of expectations on evidence for effectiveness of infrastructure interventions among the key stakeholders (i.e. governments, development community) to be based on reliable quantitative evidence of an explicit causal link between interventions and observed effects[41]. The second is the need from the private sector community for more evidence on the risk and return characteristics of their investments (i.e. development of infrastructure as an asset class). The third is increased interest in how to measure infrastructure support for economic development and wealth creation, describing further the factors and determinants of the magnitude of impact.

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[41]According to Estache (2010) the academic evaluation field has been able to grow so fast in recent years thanks to: (i) significant improvement in the volume and the quality of household income and consumption surveys conducted in developing countries; (ii) major improvements in micro-econometrics and general equilibrium modelling techniques, (iii) the increased ability of personal computers to process large data sets quite fast. Since the mid-2000s, the interest in analytically robust evaluations of the impact of projects, programs or policies has exploded among development academics and field workers. There is a particularly keen interest in evaluations based on randomized field experiments and quasi-experiments, now mainstreamed in many health, education and infrastructure activities in which international development agencies are involved. Source Estache A., (2010) , Survey of Impact Evaluations of Infrastructure Projects, Programs and Policies ECARES, Université Libre de Bruxelles ECARES working paper.

Use of micro sources of data for infrastructure analysis

The use of micro sources of data is of particular importance for infrastructure analysis, however defined, not only because of its unique characteristics involving substantial financial amounts of finance for individual projects, but also because of its more generic benefits for the economy at large and its potential to increase future growth prospects of an economy[42] (see appendix for more on definition of infrastructure).

The limited availability of consistent information on public and private investment in infrastructure has been an important barrier for more detailed empirical undertakings. As highlighted by Wagenvoort et al. (2010), there is a lack of comparable cross-country information on infrastructure investment as often comprehensive data by the government, SOEs and the private sector are not readily available. National statistics are useful, but often lack the required level of sector disaggregation for more detailed analysis and policy insights. As such, the empirical literature has often explored the effects of policies and other determinants on investment in aggregated infrastructure sectors if not all combined.

Recent research has focused on infrastructure investment, looking at the "productivity" of capital and the determinants of investment and its financing, whether public or private (IMF, 2014; OECD, 2015). It has become clear that more evidence is needed on how to measure infrastructure support for economic development and wealth creation, describing further the factors and determinants of the magnitude of impact. In addition to understanding public policy decisions regarding investment in infrastructure, for which more detailed information on the impact of infrastructure investment at the macro level is needed, information on viability issues of individual projects at the micro level is also lacking. Important questions relate to how and to which extent increased private investment in specific infrastructure sectors (potentially through different contractual modalities) affects firm productivity, innovation, and product upgrading and diversification.

Given the lack of comprehensive data on actual infrastructure investment data across countries, recent ADB analysis tried to better understand how much countries have been investing in infrastructure by considering several ways of measuring infrastructure investments. It adopted a benchmark measure that relies on country infrastructure expenditures from government budget documents plus information on private investment in infrastructure from a World Bank database[43]. According to the ADB there is room for improvement on measurement of infrastructure investments, and the report suggests a way forward through collaboration between national accounts statisticians in the region and international agencies. In recent work on infrastructure (ADB, IMF, OECD), several data sources at micro and macro level have been used to derive proxies for infrastructure investment. *See table below*

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[42] Infrastructure is a broad concept which encompasses both social and economic infrastructure. Social infrastructure comprises education, health and other community facilities. Economic infrastructure refers to utilities (electricity, telecommunications, and water) and transport (ports, airports, rail and road).

[43] As national accounts have severe data limitations the ADB has examined, three alternative measures of infrastructure investment. Building on this it was created a database covering 33 DMCs (with at least one measure each)— though years and number of economies covered vary by measurement method . The first measure uses government budget information taken from official country websites plus World Bank PPI Project database figures to capture private investment in infrastructure. The second measure mainly includes the civil engineering component of GFCF data from national accounts statistics, which covers all types of investors. And the third measure is derived from general government GFCF or GFCF(GG) available from the International Monetary Fund (IMF) plus the PPI Project database figures. See Meeting Asia's Infrastructure Needs – Asian Development Bank, February 2017.

Table 1. Available data and their respective sources below

Measurement	Sources	Description	Items covered	Items not covered
1. Budget Spending on Infrastructure	Country Budget Offices	Capex in Transp, Comm, Energy, water made by GOVERNMENT Infra Investment by SOE using budget transfers	Capex by GENERAL GOVERNMENT in chosen infra sectors	CAPEX by SOEs using self raised funds typically not covered in budget data
2. Gross Fixed Capital Formation for General Government- GFCF (GG)	National Accounts	Public Investment by general government - national/subnational gov	Government investments in fixed assets (infra and non infra)	Infra investment by SOEs not covered
3. GFCF on Construction excluding Buildings or GFCF - mainly civil enegineering works	National Accounts	Investment in construction other than buildings	Infra investment by GOV, SOEs and the private sector in structures including highways, roads, railways, airfield runaways, bridges, tunnels subways, waterways, harbors, dams, sewer systems, mines, pipelines, communication cables, transmission lines, power lines and sports fields Some non infra including mines and industrial plants	Buildings and machinery and equipment in infra projects are excluded to avoid overestimation
4. Private participation in infrastructure (project/firm)	Commercial databases	Investment in Transp, ICT, energy, water projects owned or managed by private companies	Some private investment with info from publicly available sources	Private infra investments without publicly available info are not covered by the databases
5. Financial performance - Cash flows	Public Authorities, Investors, banks, investment funds	Investment and financing across sectors	cashflow, investment and balance sheet data collected from infrastructure investors and creditors.	

Source: Adapted from ADB 2017 and OECD 2015

Public vs Private Data Available for Infrastructure

Sources of data on individual projects can come from publicly listed infrastructure corporations and public utilities or private sources such as portfolios of commercial bank loans for construction projects, development banks and project finance, investment managers, or even institutional investors themselves.

Infrastructure indices have been created to proxy the performance of listed infrastructure assets offering an accessible source of data for analysis. Major indices for listed infrastructure reported market capitalizations in excess of USD 1 trillion, but consist mostly of utilities (for example UBS World Infrastructure Index > USD 200 billion market cap, while UBS Utilities Index USD 1.2 trillion market cap).Recent OECD analysis (Business and Finance Outlook 2015) looked at investment returns in infrastructure building on listed company data[44]

The main problem with listed data, is that most indices include firms that have an infrastructure theme based on sectors but are not exclusively focused on physical infrastructure assets. Classification of infrastructure firms by sector does not necessarily explain the performance of underlying infrastructure investments, not providing a sufficiently precise definition. In fact each of these sectors comprises a variety of economic activities along its respective vertical value chain. For example, the ports sector may include operators of port facilities such as piers and terminals as well as providers of ancillary port services such as tugging, fuelling, and ship maintenance.

In the in depth analysis conducted by EIOPA for the re-calibration of Solvency II, the infrastructure definition covered investments in infrastructure project debt and equity (both directly and via funds). Debt and equity of corporates in the infrastructure sector were excluded as a clear delineation was not feasible to prevent non-infrastructure activities benefitting from a potentially more favourable treatment in the Solvency II regime[45].

Most of the necessary information is private and scattered amongst numerous firms. Data collection, when it exists, is ad hoc and relies on existing practices instead of promoting data collection according to the requirements of proper asset pricing and risk measurement methods. Some specialist publications and data providers have details of various transaction terms, yet many transactions are subject to non-disclosure agreements.

The amount of available data is limited in scope, since not all types of infrastructure projects exist in large numbers, and in time, because infrastructure investments may have multi-decade lives and available records are unlikely to span such periods. When transactions reach financial close, procuring authorities receive the final transaction documents containing the commercial terms for each deal. However few governments collect data at a central level in a systematic way and procuring authorities are under no legal obligation to provide this information. For example a report of the National Audit Office in the UK found that despite the long experience with PPPs and PFIs, government departments are lacking comprehensive data on the costs of debt and equity of their deals[46].

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[44] Based on the Bloomberg World Equity Index including 10130 listed companies in 76 countries operating in infrastructure, general industry and clean energy sectors over the period 2002-2014. 1327 (i.e., 847 in advanced economies and 480 in emerging economies) companies are operating in infrastructure sector, 8033 in general industry sector (i.e., 5 078 in advanced economies and 2 955 in emerging economies) and 770 in clean energy sector (i.e., 478 in advanced economies and 292 in emerging economies). The infrastructure sector definition is based on the MSCI Infrastructure Index sector classification; i.e., telecommunication infrastructure (3 sectors), utilities (4 sectors), energy infrastructure (1 sector), transportation infrastructure (3 sectors), and social infrastructure (2 sectors).

[45] See recent follow up work conducted by Eiopa and the recent Call for advice from the European Commission on the identification and calibration of infrastructure investment categories, July 2 2015

[46] In the UK for example until 2011 information on all PPP deals (including PFI) was collected by Partnerships UK (PUK). This data is incomplete – only 31% of entries in the database provided information on debt and equity returns and no information on the financial terms of the 58 deals of 2010 and 2011 was requested. Since 2012 HM Treasury has requested summary financial close data from each procuring authority for centrally supported PFI projects and it has data for 86% (25 of 29 projects) that reached financial close since 2012.

While Private equity managers could be more transparent and aim to provide performance measures that are more relevant to long-term investors, taken individually, none of them has access to enough information to answer the private equity asset allocation question. Without the constant feedback of market prices, long-term investment increases information asymmetry between investors and their managers, as well as investors' corollary demand for monitoring and reporting. On the other hand, although overall investment is still limited, some investors have built over the last decades a significant allocation to the sector and have been monitoring their investments for some time. The OECD's recent LPF and PPRF survey included 71 funds from around the world, of which 28 reported exposure to unlisted infrastructure equity; of this subset, 14 had dedicated target allocations[47].

Performance and credit profile of infrastructure debts (through the experience of banks and rating agencies) can shed light on infrastructure as an asset class by helping to describe ex-post project risk, and to relate this risk to corporate risk – which is already well understood by most investors. While the market for infrastructure funds (of all types) is in its infant stages and availability of reliable data on returns to investment in infrastructure is scarce, there have been a number of industry-based and academic studies that have analysed returns. These are shown in Table 2 below.

Table 2 - Summary of Infrastructure Return Figures

Type	Source	Institution	Publication Date	Period Studied	Geographic Region	Annualised Return Figure (%)
Unlisted Fund	Academic	Peng and Newell	2007	1995 - 2006	Australia	14.11
Unlisted Fund	Academic	Newell et al.	2011	1995 - 2009	Australia	14.11
Unlisted Fund	Academic	Finkenzeller et al.	2010	1994 - 2009	Australia	8.2
Unlisted Fund	Academic	Hartigan et al.	2011	1998 - 2008	UK	6.5
Unlisted Fund	Private Sector/Industry	Macquarie	2004	1995 - 2002	Australia	19.2
Unlisted Fund	Private Sector/Industry	Mercer	2005	1996 - 2005	Australia	13.3
Unlisted Fund	Private Sector/Industry	Colonial First State	2006	1996 - 2006	Australia	13.5
Unlisted Fund	Private Sector/Industry	Colonial First State	2010	2001 - 2010	Australia	11.1
Listed Funds	Academic	Peng and Newell	2007	1995 – 2006	Australia	22.5
Listed Funds	Index Provider	ASX	2010	2006 - 2010	Australia	-2.79
Listed Securities	Private Sector/Industry	Macquarie	2009	1994 - 2009	Global	4.2
Listed Index	Private Sector/Industry	FTSE/IDFC	2011	2006 - 2010	India	32.1
Listed Index	Private Sector/Industry	UBS	2011	2006 - 2010	Asia/Pacific	5.7
Listed Index	Private Sector/Industry	Dow Jones Brookfield	2011	2002 - 2011	Global	14.6

[47] Six funds indicated that they planned to increase target allocations in the next few years while seven additional funds planned to establish a dedicated target allocation. The ten largest pension funds that submitted data increased alternatives from 17.6% to 19.5% of the total portfolio, on average, from 2010 to 2013. Public pension reserve funds also increased alternatives from 10.5% to 14.7% on average - an increase of 4.2 percentage points, over the same time period (OECD 2014).

Listed Index	Index Provider	S&P	2017	2006 - 2017	Global	-0.5
Listed Index	Index Provider	S&P	2017	2006 - 2017	Emerging Markets	-1.5
Listed Index	Index Provider	MSCI	2017	2002 - 2017	Global	8.9
Listed Index	Index Provider	MSCI	2017	2002 - 2017	Global	11.8
Listed Index	Index Provider	MSCI/IPD	2016	2006 – 2010	Australia	11.4
Unlisted Equity Index	Index Provider	MSCI/IPD	2016	2006 - 2016	Global	15.3
Unlisted Equity Index	Academic	EDHEC Infrastructure Institute	2017	2000 - 2016	Europe	10.17
Unlisted Debt Index	Academic	EDHEC Infrastructure Institute	2017	2000 - 2016	Europe	3.83

Source: OECD (2014) Pooling of institutional investors capital – selected case studies in unlisted equity infrastructure

Challenges Related to the Existing Infrastructure Investment Databases

A number of commercial databases are relevant when investigating infrastructure investment. In Table 3 and in appendix are reviewed data providers with systematic data across multiple countries (covering both cross border and domestic finance), investors and financiers. The OECD has also developed relevant work on data sources for estimating private climate finance (See Caruso, R. and R. Jachnik (2014)).

Using firm or project data in the infrastructure sector faces several challenges such as the lack of a commonly applied definition for infrastructure (i.e. by sector, stage of development or geographic region); the different routes to invest in infrastructure (i.e. infrastructure funds, listed companies, corporates etc.), issues with confidentiality and privacy of necessary data. Challenges are due to the fact that projects are often very different from one another and dependent on the regulatory framework or concession agreement, and more broadly on the type of contract used. For example, differences in geographical size, legal framework, and the dispersion of population are important factors affecting investment in infrastructure.

Also commercially available project-level database, are not subject to any official validation and may be subject to coverage shortcomings and inconsistencies. Although what is reported may include data beyond project finance, also corporate finance for certain databases it may not represent the full spectrum of private investment possibilities. Data may include also Public-Private Partnerships (PPPs), which may involve public support and investment, although capital expenditures in PPPs are normally privately financed. Also, it only records investment at the time of commitment, not when actual disbursements are made.

These limitations are exacerbated when discussing low-carbon and climate resilient infrastructure sectors as individual assets may not be labelled as such, which requires assumptions as to the perspective carbon footprint of an infrastructure asset.

Table 3 - Main Infrastructure Financing Commercial Databases

	Corporate	Projects/ Transactions	Investment Funds	Others
Bloomberg	✔	✖	✖	✖
Bloomberg New Energy Finance	✖	✔	✖	✖
Thomson Reuters - Worldscope	✔	✖	✖	✖
Thomson Reuters ESG research data	✖	✖	✖	✔
Thomson Reuters Global Syndicated Loans	✖	✖	✖	✔
Thomson Reuters ONE	✖	✖	✔	✖
Orbis	✔	✖	✖	✖
Osiris (Bureau van Dijk)	✔	✖	✖	✖
Dealogic Project Finance	✖	✔	✖	✖
Dealogic M&A	✖	✔	✖	✖
Thomson Reuters - Project Finance International	✖	✔	✖	✖
IJ Global - Infrastructure Journal	✖	✔	✖	✖
Preqin	✖	✖	✔	✔
CEM Benchmarking	✖	✖	✔	✖
State Street	✖	✖	✔	✖
Financial Times	✖	✖	✖	✔
FactSet	✖	✖	✖	✔
Clean Energy Pipeline	✖	✖	✖	✔

Note: See ANNEX 2 for a detailed description of the databases

Selected Initiatives on data collection

Policy and industry initiatives have been launched to try to get a better understanding of infrastructure investment using sources ranging from country budget offices and national accounts to commercial databases. Different institutions are taking different approaches to infrastructure valuation and analysis. Differences lie in the sources of data themselves, in perspective, or in the level of granularity. For instance, looking at country-level data is helpful to understand capital flows and market-level regulatory effects on investment. Project level and corporate data is needed for understanding the risk/return characteristics of infrastructure assets. Additional granularity on main risk factors is gained through data on operational metrics of individual projects such as construction-level characteristics, traffic forecasts etc.

ESG management standards and tools could for example assess the presence of environmental and social management systems or the presence of an anti-bribery management system. Performance indicators could report on energy efficiency, the climate resilience and infrastructure adaptability, or the preservation of water resources for instance.

There are also several initiatives tracking the size of the financial flows of private investment mobilization and co-financing taking different approaches and methodologies (i.e. OECD Development Assistance Committee and MDB Task Force on Measuring Private Investment Catalysation) [48].

Among the relevant initiatives focusing on micro data for infrastructure analysis:

World Bank Private Participation in Infrastructure Projects Database

The World Bank Private Participation in Infrastructure Projects Database identifies and disseminates information from publicly available sources on private participation in infrastructure projects in low- and middle-income countries. The database highlights the contractual arrangements used to attract private investment, the sources and destination of investment flows, and information on the main investors. By providing these data to government policy-makers, consumer representatives, the donor community, and other stakeholders, the database contributes to the public debate on the private provision of infrastructure (finance).

This database currently reports project-level information in energy, transport, telecommunications, and water and sewerage sectors for 139 low and middle income countries. The database includes projects with at least 20% private participation. It provides information on the project level, including country, financial closure year, infrastructure services provided, type of private participation, technology, capacity, project location, contract duration, private sponsors, and development bank support[49].

Global Emerging Markets Risk Database (GEMs)

GEM[50]s is the largest default and loss database for emerging markets. It was created by the European Investment Bank (EIB) and the International Finance Cooperation (IFC), a member of the World Bank Group, in 2009. Its objectives are to foster cooperation among International Financial Institutions (IFIs) and MDBs, to contribute to the development of financial markets in emerging countries and to promote industry best practices in the field of risk management.

The database is accessible only to the member MDBs. In 2015 it included approximately 7,700 counterparts, 1,600 default events, and 1,750 resolved contracts. The information in the database is gathered through standardized data collection processes, with the counterparts' identities anonymous and

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[48] For a detailed discussion of public financial institutions' efforts to capture private co-financing, see Caruso and Ellis, 2013.

[49] The data and methodology can be found at: http://ppi.worldbank.org/.

[50] http://www.gems-riskdatabase.org/about-gems/in- dex.htm

data confidentiality preserved. The data gathered are used to calculate and report default rates and rating migrations of the members' counterparties and the recovery rates of defaulted projects.

The risk database and common methodology adopted by EIB and IFC have been reviewed over time. Standard & Poor's validated the GEMs methodology and its data quality in 2009, Moody's conducted another in- dependent examination of the GEMs operations in 2013 and another Data Review Exercise was conducted in 2016.

EDHEC infra database

EDHECinfra database is a collection of cash flow, investment and balance sheet data collected from infrastructure investors and creditors. To date, the database covers more than 500 individual infrastructure assets over 10 different countries and a period of 15-20 years, making it the most comprehensive database of infrastructure cash flows available for research.

The EDHEC Risk Institute has highlighted the need to address the scarcity of historical data on the past performance of infrastructure debt and equity instruments and of project cash flows. The aim was to provide benchmarks for long term investment. This would help investors to determine expected behaviours of long term infrastructure investment (i.e. unlisted and illiquid assets) and help regulators develop appropriate risk weights associated with this sort of investment. In June 2017, EDHEC Risk Institute launched 192 "EDHECinfra Private Equity"[51] and "EDHECinfra Private Debt"[52] indices.

Moody's risk performance studies

Moody's is undertaking a project reporting on the historical performance of **rated infrastructure project debts**, covering 5,308 transactions from the periods 1983 to 2015. The goal is to report on default and recovery experience in such debts compared to straight non-financial corporate bond issuance, providing a better basis to analyse the unique risk profiles of infrastructure project finance debt. A central question to answer is whether loss severities in project debts are better than similarly rated vanilla corporate bonds (this would help to support the hypothesis that infrastructure projects are lower risk than commercial projects). The dataset is large and covers multiple market cycles, allowing for a robust comparison. The July 2016 report analysing the dataset shows for example that infrastructure ratings are more stable than those non-financial corporates; it also shows that credit loss rates for infrastructure debts are lower over medium/long term compared with like-rated non-financial corporates.

In addition to the data on rated infrastructure debt, Moody's relies on a consortium of financial institutions to provide data on the historical performance of **unrated project finance bank loans**. The database includes 6,389 projects representing 62 percent of all project finance transactions originated worldwide over the period between 1983 and 2015. For the unrated project finance bank loans, the objective is also to compare the default and recovery experience with non-financial corporates with similar ratings. In March 2017, Moody's published the update of its analysis of the dataset showing for example that the recovery rates are high, that the default in the infrastructure industry sector between 2009 and 2015 are due to demand risk, or that PPP projects have default rates lower than the study average.

MSCI-IPD

MSCI's IPD launched several initiatives with the aim to create a well-diversified global private equity infrastructure index. Two indexes have been launched:

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[51] https://benchmarks.infrastructure.institute/equity/

[52] https://benchmarks.infrastructure.institute/debt/

- The **MSCI Australia Unlisted Infrastructure Index**[1]: a fund index that intends to track the return performance of unlisted infrastructure investment funds domiciled within Australia - the index includes 23 funds. Transport represents 59 percent of the index's sector exposure followed by Power transmission and generation at around 20 percent, Water at 10 percent and Renewable Energy, Public Facilities, and Communication at less than 3 percent.
- **IPD Global Infrastructure Direct Asset Index**[2]: an index that measures the equity performance of infrastructure assets globally. The index includes 123 investments for a total equity valuation of around USD 31 billion. As of December 2016, the index's investments are located in Australia (47 percent), Europe (41 percent), North America (9 percent), and New Zealand (3 percent). The sector exposure of the index includes Transport excluding airports (27 percent), Airports (21 percent), Water (19 percent), Power Transmission (17 percent), Renewable Energy, and Power Generation, Public Facilities and Communication at respectively less than 1 percent.

Infralatam

The objective of the *Infralatam* initiative is to measure infrastructure investment in Latin American countries. Its aim is the standardized estimation of resources allocated to water and sanitation, energy, irrigation, telecommunication and transport infrastructure in order to make comparison between countries. The database includes data on both public and private infrastructure spending, in nominal terms as well as a percentage of GDP. The initiative, launched in 2011, is a joined effort by the Inter-American Development Bank (IDB), the Development Bank of Latin America (CAF), and the Economic Commission for Latin America and the Caribbean (ECLAC).

The database includes infrastructure investment data at current prices, in local currency or USD, and as a percentage of GDP. It describes the share of private and public investment. The data is provided since 2008 for the water, power, telecommunications, and transport sector. Although investment figures are not systematically reported for each year, the database includes information for the following countries: Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Trinidad and Tobago.

SOURCE

SOURCE is an initiative jointly launched by various Multilateral Development Banks (MDBs) and the Sustainable Infrastructure Foundation (SIF) which aims at aggregating and processing information in all dimensions of infrastructure project preparation to create a free of charge, global and public support platform. The platform is intended to be used by national and subnational governments to improve the preparation and implementation of infrastructure projects, with a particular focus to integrate the SDGs. Overall, SOURCE aims to enable all infrastructure stakeholders, including MDBs, DFIs, infrastructure investors, consultancy firms, contractors and lenders, to work together on aligning public and private interests and project development requirements in order to increase private sector infrastructure investment and delivery. The platform pulls together data from project managers and other users of the application to cover the entire process of project planning and implementation. Using analytical tools, the data is processed to identify and assess trends in the infrastructure sector and shed light on current project pipelines and market achievements in various jurisdictions around the world. SOURCE was initiated in 2010 by the Asian Development Bank (AsDB), has been tested by MDBs in 6 pilot countries and was then globally launched in January 2016. SOURCE is now used by 40 governments.

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[1] https://support.msci.com/documents/1296102/8ec13e3e-5db3-4bb5-852f-39502974c6eb

[2] https://support.msci.com/documents/1296102/0e192d3c-bbfb-4e3a-958f-8ba934d2d848

The ESG performance of infrastructure assets

Many international standards, such the Global Infrastructure Basel's SuRe, have been developed in order to integrate sustainability and resilience aspects into infrastructure development and upgrade. In addition to the project-focused tools such as SuRe, initiatives such as GRESB address infrastructure sustainability issues at the asset and the fund levels. In practice, GRESB provides a tool coupled with a scoring methodology that assesses ESG performance of assets in line with international standards such as PRI standards.

Table 4 - Examples of Sustainable Infrastructure Standards and Benchmarks

Standard	Description	Certifying body
SuRe [53] (The Standard for Sustainable and Resilient Infrastructure)	A voluntary standard which integrates sustainability and resilience aspects into infrastructure development and upgrade. SuRe consists of 63 criteria divided into 14 themes spanning environmental, social and governance (ESG) aspects.	The Global Infrastructure Basel
Envision [54]	A rating system for sustainable infrastructure. It provides a framework for evaluating and rating the community, environmental, and economic benefits of infrastructure projects during the planning and design phase, as well as when projects are finished.	The Institute for Sustainable Infrastructure
CEEQUAL	International evidence-based sustainability assessment, rating and awards scheme for civil engineering.	CEEQUAL
GRESB Infrastructure Assessment	GRESB Infrastructure provides systematic assessment, objective scoring, and peer benchmarking for environmental, social, and governance (ESG) performance of infrastructure companies and funds. It is specifically targeted towards institutional investors as it allows them to request ESG reporting from investments.	

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[53] http://www.gib-foundation.org/content/uploads/2017/01/SuRev0.3final.pdf

[54] https://sustainableinfrastructure.org/envision/

ANNEX 1 - Defining investment in infrastructure

The OECD succinctly defines infrastructure as the system of public works in a country, state or region, including roads, utility lines and public building – in essence the tangible backbone of essential goods and services underpinning an economy. Infrastructure investments are direct or indirect stakes in entities that own or operate these assets. Where commodity risk is more present, the infrastructure label is less likely to be applied (Moody's 2015)[55].

Infrastructure is a broad concept which encompasses both social and economic infrastructure. Social infrastructure comprises education, health and other community facilities. Economic infrastructure refers to utilities (electricity, telecommunications, and water) and transport (ports, airports, rail and road). Recent ADB work has considered infrastructure as fixed asset investments using UN classifications (see below).

Measuring Economic Infrastructure (Source ADB 2017)

Recent ADB work has considered infrastructure as fixed asset investments in four sectors—transport (road, rail, air, and ports); energy; telecommunications; and water and sanitation, using UN classifications.

Assets include civil engineering works, nonresidential buildings, and the machinery and equipment necessary to provide infrastructure output. Each sector is defined below by product codes based on the United Nations Central Product Classification 2.1 (CPC 2.1) system.

Transport includes civil engineering works on highways, bridges, streets, roads, railways, tunnels, airfield runways, ports/harbors, waterways, and related harbor and waterway facilities, among others. Residential buildings are excluded, but nonresidential buildings such as transport terminals are included. Except for railway and tramway locomotives and rolling stock, other transport equipment, such as vehicles, airplanes, and ships are excluded. Additionally, general and special purpose machinery and equipment in rail transport as well as information and communication technology (ICT) machinery and equipment for all transportation subsectors are also included.

Energy encompasses nonresidential buildings and civil engineering works for power plants, power stations, hydroelectric dams, electricity grids, long-transmission lines, power lines, transformer stations, and gas and oil pipelines, among others. It also includes ICT and general and special purpose machinery and equipment related to the generation, transmission, and distribution of energy, but excludes transport equipment.

Water and sanitation includes nonresidential buildings, civil engineering works and machinery and equipment for dams, irrigation and flood control waterworks, local water and sewer mains, local hot-water and steam pipelines, sewage, and water treatment plants. Related ICT and general and special purpose machinery and equipment are included, but transport equipment is excluded.

Telecommunications comprises nonresidential buildings and civil engineering works for telephone and internet systems, land- and sea-based cables, communication towers, and telecommunication transmission lines, among others. It also includes general and special purpose machinery and equipment related to transmitting information along telecommunication networks along with ICT machinery and equipment in conducting everyday business, such as computers and telephone lines. Importantly, social infrastructure—such as health, education, and other social services—is excluded from infrastructure covered here.

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[55] Natural resource extraction (such as oil or gas) is not vital to the functioning of an economy; a country can import such commodities. Yet energy distribution networks are fixed and essential (Moody's 2015).

The MDB Task Force on Measuring Private Investment uses for purposes of joint reporting considers infrastructure as the underlying physical foundation or civil works that support economic and social development (including integral and/or dedicated equipment and excluding captive infrastructure, i.e. infrastructure reserved for the private use of a firm, in the following sectors:

- Energy (includes electricity generation, transmission, distribution)
- Water and waste management (water and sanitation, solid waste, irrigation, flood control)
- Transport (roads, ports, airports, urban transport, railway, fluvial and maritime transport)
- Telecommunications
- IT within infrastructure sectors
- Social Infrastructure (investments in physical facilities eg schools, hospitals)

Investments in infrastructure, however defined, are a rather specific type of investments not only because of its unique characteristics involving substantial financial amounts of finance for individual projects, but also because of its more generic benefits for the economy at large and its potential to increase future growth prospects of an economy.

There are a number of important characteristics that are attributable to infrastructure investments, including the high barriers to entry, the monopolistic or dominant market position, the long-term duration of assets, and the high upfront costs vis-à-vis relatively low operational costs. Infrastructure provision is also prone to many externalities (both positive and negative) and tends to display public good characteristics (both non-excludable and non-rivalrous). These forces call for carefully calibrated policies, which need to be understood, monitored and evaluated to ensure that there is a correspondence between different types of market failures and instruments.

From an investment standpoint, infrastructure is often described using categories such as geography, industrial sector, economic or social purpose[56], or phase of asset development (e.g. greenfield/brownfield), yet it also escapes a widely agreed upon definition. Core infrastructure assets (brownfield) have the following common characteristics: large, long-term assets providing essential services, limited or no competition and high barriers to entry, predictable and steady cash flows with a strong yield component, inflation protection (through built-in contracts or regulated prices), and a lower correlation to the business cycle. These generalised characteristics serve as an indicator of the potential properties of infrastructure as a whole, yet only some of the assets in the universe meet these requirements (Weber and Alfen, 2010).

Infrastructure investments often have higher levels of leverage than non-infrastructure investments, presumably because cash flows are less volatile and sponsors of infrastructure projects are willing to accept higher levels of debt (Beeferman and Wain 2012)[57]. Broadly citing the literature, high leverage in project finance might actually mitigate certain financial risks by introducing the concepts of the "discipline of debt"[58] and that debt can actually lower the cost of finance, without increasing the cost of equity. Capital structure thus matters greatly in impacting risk and return and must be analysed on a project-by-project basis.

Future cash flows in project finance are often defined by contract terms which tend to limit economic exposure, yet the smoothing of unlisted infrastructure equity valuation and infrequency of appraisals can

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[56] Economic infrastructure would include toll-roads, bridges, tunnels, airports, seaports, railroads, gas and electricity distribution, water distribution, waste removal, and renewable energy production. Social infrastructure includes schools, correctional facilities, healthcare, and aged-care facilities (Beeferman et al. 2012).

[57] Statement is based on a survey distributed by the authors of U.S. public pension funds on their beliefs on infrastructure investments.

[58] Large interest and principal payments can force management to improve performance and operational efficiency - the so called "discipline of debt" (Tuck 2002). Debt payments also reduce free cash flow available for managers to use at their discretion (Helm and Tindall 2009).

give the appearance of lower volatility, obscuring its true systematic risk exposures. MSCI research has found that the betas of private equity and private real estate increase over time, largely due to this smoothing effect (Gilfedder and Shepard, 2014). For example, as a private equity fund approaches liquidation, more frequent portfolio appraisals and the anticipated exit of private equity stakes through IPOs increases beta, yet the risk in the actual entity being sold may not necessarily be larger than at earlier stages in the life of the investment.

In in depth analysis conducted by EIOPA for the re-calibration of Solvency II, the infrastructure definition covered investments in infrastructure project debt and equity (both directly and via funds). Debt and equity of corporates in the infrastructure sector were excluded as a clear delineation was not feasible to prevent non-infrastructure activities benefitting from a potentially more favourable treatment in the Solvency II regime[59].

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[59] While enough evidence was found for a lower risk definition of infrastructure based on project finance terms, the decision for a different treatment of corporate infrastructure is still pending

ANNEX 2 - Existing Databases

Table 5. Main databases for infrastructure financing

Type of Data Source	Public/Private	PROVIDER	DESCRIPTION
Corporate	Commercial database	Bloomberg	Extensive equity and debt capital markets data for listed corporates, municipals and sovereigns. This includes equity, bond markets, foreign exchange markets, credit markets, as well as an important set of pricing and data analytics tools.
	Commercial database	Thomson Reuters - Worldscope	Listed Companies Data – both equity and debt capital markets.
	Commercial database	Orbis	Over 99% of the companies on *Orbis* are private. Private company information is more difficult to obtain, as the legal obligation to file accounts varies widely from country to country.
	Commercial database	Osiris (Bureau van Dijk)	Osiris has information on listed, and major unlisted/delisted, companies around the world. The information is very detailed and includes a lot more than financial reports. Different templates are used to show accounts in the correct formats for their company type and location.
Projects/Transactions	Commercial database	Dealogic Project Finance	Project Finance Transactions database. The database covers all infrastructure sectors and geographies. It provides both aggregate data on transactions as well as on specific tranches, including pricing details when available.
	Commercial database	Dealogic M&A	Database global capital markets information - global equity and fixed income transactions
	Commercial database	Thomson Reuters - Project Finance International	Project Finance Transactions database. The database covers all infrastructure sectors for all geographies. Limited details on the transactions and difficult to access and use.
	Commercial database	IJ Global	Infrastructure project and transaction database. The database covers all infrastructure sectors (social and defence, mining, oil and gas, renewable energy, water, and transport), for all geographies and both project finance and corporate balance sheet financing transactions. The data base provides extensive details on the transaction, including pricing details when available. However, public financing transactions, as well as China are not covered.
	Public database	World Bank Group	This database reports project-level information in energy, transport, telecommunications, and water and sewerage sectors for 139 low and middle income countries. The database includes projects with at least 20% private participation. Details are also available on type of project— whether a project is a management and lease contract, a brownfield project, a greenfield project, or a divestiture
Investment Funds	Commercial database	*Preqin*	Private Equity and Venture Capital modules of alternative asset funds and deals. Infrastructure investments and fund module

Type of Data Source	Public/Private	PROVIDER	DESCRIPTION
	Commercial Database	CEM Benchmarking	Pension fund analysis and benchmarking services including defined benefit, defined contribution, benefit administration with best practices and health care. Also provides benchmarking information for endowments/foundations and sovereign wealth funds.
	Commercial Database	State Street	Financial data analytics for institutional investors. Amongst its offering, State Streets provides benchmarks, indices and indicators.
	Commercial database	BNEF	BNEF database of clean energy and carbon investments (equities, corporate and asset-backed bonds, syndicated debt, VC, PE and M&A). BNEF database that includes information on financial transactions associated with "new energy" (defined as renewable energy generation, energy storage, carbon capture and storage, etc.). According to the metadata, the database covers all relevant projects worldwide above a certain threshold capacity. For example, projects with at least 1 MW of installed capacity in geothermal, solar and wind energy generation, 1-50 MW for hydropower, and all marine energy projects are included (BNEF 2012).
	Public database	UNEP Risø Centre	Clean Development Mechanism project pipeline.
Other	Commercial database	Thomson Reuters ESG research data	ESG database.
	Commercial database	Thomson Reuters Global Syndicated Loans	industry-leading syndicated loan transaction information
	Commercial database	Thomson Reuters ONE	ThomsonOne database of project finance transactions, PE and VC, as well as M&A data
	Commercial database	Financial Times	fDi Markets database of cross-border greenfield investments
	Commercial database	FactSet	FactSet's databases on private equity transactions, M&A, and private company ownership
	Commercial database	Clean Energy Pipeline	Clean energy and low-carbon investment database (equities, corporate and asset-backed bonds, syndicated debt, VC, PE and M&A). Good transactions type and geographic coverage.

| Type of Data Source	Public/Private	PROVIDER	DESCRIPTION
	Public database	OECD	Directorate for Financial and Enterprise Affairs' aggregate FDI statistics
	Public database	United Nations Conference on Trade and Development	FDI statistics including a one-time attempt (in 2010) to measure low-carbon FDI

Measuring the mobilisation effect of official development finance interventions

As the international community works to implement a new, broader development framework to achieve the ambitious Sustainable Development Goals, questions about how private resources could best be mobilised for financing development are at the heart of the debate on development finance. The DAC has been working on this issue under a mandate from the December 2014 and February 2016 High Level Meetings with the aim to establish an international standard for measuring the volume of private finance mobilised by official development finance interventions. This work is carried out in consultation with multilateral and bilateral development finance institutions, as well as in close collaboration with the OECD-led Research Collaborative on tracking private climate finance. It is also expected to contribute to the ongoing development of a broader measurement framework of total official support for sustainable development (TOSSD) and the DAC work stream on blended finance.

The HLM also mandated data collection on amounts mobilised through leveraging instruments. Regular data collection on amounts mobilised in DAC statistics has been implemented (as from 2017) starting with three leveraging instrument/mechanism: guarantees, syndicated loans and shares in collective investment vehicles (CIVs). Work is currently ongoing to develop methodologies for a broader range of instruments, including credit lines, direct investment in companies and other complex blended finance operations (e.g. PPPs).

Following a series of surveys carried out since 2012 to pilot methodologies[60] for measuring mobilisation, the DAC has recently published the preliminary results of its 2016 Survey[61], covering two additional leveraging instruments/mechanisms: credit lines and direct investment in companies (DICs). The results showed that, in 2012-15, **USD 81.1 billion were mobilised from the private sector by official development finance interventions** in form of guarantees, syndicated loans, shares in CIVs, credit lines and DICs. Compared to previous DAC surveys, amounts mobilised continued on their upward trend, increasing from USD 15.0 to 26.8 billion between 2012 and 2015. Results confirmed that the main leveraging instrument to date is guarantees (USD 35.9 billion mobilised, representing 44% of the total). They, however, also underline the mobilisation effect of the other instruments surveyed, i.e. syndicated loans and credit lines (19% each), shares in CIVs (12%) and DICs (6%).

Figure 1. Private finance mobilised in 2012-15, USD billion[62]

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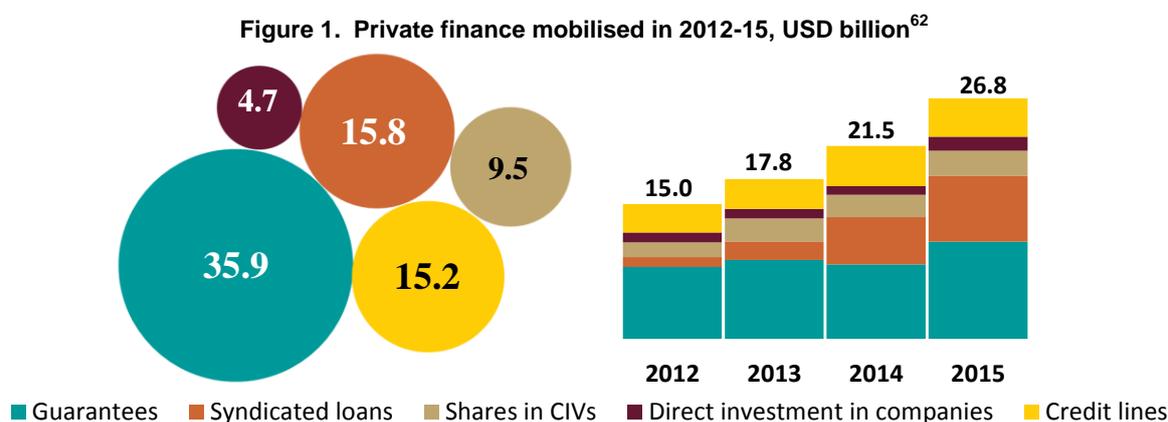
[60] The methodologies follow a number of principles underpinning an international statistical system: to be realistic, feasible and avoid double-counting, the methodologies strive to be conservative (causality), fair (pro-rated attribution to all official actors) and pragmatic (point of measurement and data availability).

[61] See more results at: http://www.oecd.org/dac/stats/mobilisation.htm.

[62] The increase in the amounts mobilised by syndicated loans as from 2014 is mostly explained by the fact that the IFC provided data for this instrument for 2014-15 only.

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