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Sector-level approach to estimating mobilised private climate finance

THE CASE OF RENEWABLE ENERGY

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**SECTOR-LEVEL APPROACH TO ESTIMATING MOBILISED PRIVATE CLIMATE FINANCE:
THE CASE OF RENEWABLE ENERGY - ENVIRONMENT WORKING PAPER No. 98**

by **Raphael Jachnik (OECD) and Victor Raynaud (OECD)**

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ABSTRACT

In order to help address climate finance-related information needs under the UNFCCC, this paper explores the extent to which currently-available secondary data make it possible to estimate private finance mobilised by developed countries for climate action in developing countries. This is done by testing the implementation of two approaches: the first one based on an analysis of an investment-related commercial database, and the second one based on the use of publicly-available private finance leverage ratios. Due to data constraints, the focus is on renewable energy as a sub-set of climate mitigation activities.

Volumes of private finance estimated as mobilised under the first approach are very partial, due to limitations of the database used, while the second approach results in highly inaccurate extrapolations due to a current lack of empirically-robust publicly-available private finance leverage ratios. These findings highlight the need for improved primary data collection, in particular by public climate finance providers on private co-finance, building upon the recent progress already achieved by a number of bilateral and multilateral development finance institutions. Further, very careful and transparent use should be made of leverage ratios, as they are highly sensitive to both the underlying calculation methods (e.g. in terms of attribution of mobilised private finance among public actors involved), as well as to core characteristics of public finance that result from varying mandates of development agencies and institutions. In any case, amounts of private finance mobilised by public actors and interventions (and ratios that can be calculated on such basis) should not necessarily be interpreted as reflecting their respective abilities to achieve effective and transformational climate action, which requires monitoring of impacts over time.

JEL Codes: F21, F53, G2, O16, O19, Q42, Q54, Q56

Keywords: climate change, renewable energy, public interventions, private finance, mobilisation, leverage

RÉSUMÉ

Afin d'aider à répondre aux besoins d'informations concernant le financement climatique dans le cadre de la CNUCC, ce document explore dans quelle mesure les données secondaires actuellement disponibles rendent possible l'estimation des financements privés mobilisés par les pays développés pour l'action climatique dans les pays en développement. Deux approches sont testées dans ce but : la première faisant usage d'une base de données commerciale de flux d'investissements, et la seconde de ratios d'effet de levier de finance privée rendus publics. Compte tenu des données disponibles, l'étude se concentre sur les énergies renouvelables en tant que sous-ensemble des activités d'atténuation au changement climatique.

Les volumes de financement privé estimés comme mobilisés par la première approche sont très partiels du fait des limitations inhérentes à la base de données utilisée, tandis que les extrapolations résultant de la seconde approche sont très inexactes compte tenu du manque actuel de ratios d'effet de levier de finance privée fiables. Ces constats soulignent un besoin de collecte de meilleures données primaires, en particulier par les bailleurs de fonds publics concernant le co-financement privé, en poursuivant les progrès récent déjà réalisés par un certain nombre d'institutions bilatérales et multilatérales de développement. De plus, une utilisation prudente et transparente des ratios d'effet de levier est nécessaire compte tenu de leur grande sensibilité à la méthode de calcul sous-jacente (ex. attribution du financement privé mobilisé entre acteurs publics concernés) et aux caractéristiques clés de la finance publique découlant des différents mandats des agences et institutions de développement. Dans tous les cas, les montants de financement privé mobilisés par les acteurs et interventions publics (ainsi que les ratios pouvant être calculés sur cette base) ne doivent pas être nécessairement interprétés comme reflétant leurs capacités respectives à atteindre des résultats efficaces et transformationnels en termes d'action climatique, ce qui nécessite un suivi des impacts dans le temps.

Codes JEL : F21, F53, G2, O16, O19, Q42, Q54, Q56

Mots clés : changement climatique, énergies renouvelables, interventions publiques, financement privé, mobilisation, effet de levier

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EXECUTIVE SUMMARY

As the international community seeks to scale up climate finance globally, robust estimation and in-depth understanding of current volumes of climate finance can play a key role in informing public decision- and policy-making. Under the United Nations' Framework Convention on Climate Change (UNFCCC), there is a specific need to assess progress towards the fulfilment of the commitment made by developed countries to mobilise USD 100 billion of finance per year by 2020 for climate action in developing countries. Such finance can come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources. Hence, while the public sector plays an important role in financing climate action, the participation of the private sector is critical to achieve the scale needed to transition to low-carbon, climate resilient economies.

To help improve data availability and methodologies to estimate publicly mobilised private climate finance, the OECD has been hosting since end 2012 a Research Collaborative on Tracking Private Climate Finance. In order to ensure relevant synergies, the Research Collaborative has established active co-operation with initiatives by a range of actors involved in defining methods and/or collecting primary data on mobilised private climate finance. These include in particular groups of multilateral development banks (MDBs) and bilateral development finance institutions (DFIs), as well as the OECD Development Assistance Committee (DAC).

The aim of the present study, undertaken under the Research Collaborative, is to complement these initiatives while avoiding duplicative work. To do so it **explores the extent to which currently-available secondary data (in contrast to project-level primary data gathered by finance providers themselves) make it possible to estimate private finance mobilised by developed countries for climate action in developing countries**. Due to data constraints, the focus is on renewable energy (hydro-, solar-, wind-, marine-, geothermal-, and bio-energy-related projects) as a sub-set of climate mitigation activities. The study tests the practical implementation of two approaches, providing transparency about methodological choices made, highlighting present shortfalls, and assessing the level of robustness and completeness of resulting estimates. Conclusions drawn on this basis may inform on-going efforts to collect better underlying primary data and further develop estimation methodologies.

The first approach to estimating mobilised climate finance is based on analysing and aggregating transactions recorded in a commercial database that provides best-available data to date on investments in renewable energy projects globally, including in developing countries. The second approach combines aggregate volumes of renewable energy-related bilateral and multilateral public development finance tracked by the OECD DAC and public finance institutions themselves with relevant publicly-available private finance leverage ratios.

Volumes of private finance estimated as mobilised under the first approach are only partial, due to the limitations of the commercial database used. In particular, information on 60% of deal values was unavailable. Imputation techniques combining known information about project size with assumptions about average technology costs and country-or region-specific installation costs can be applied to derive more comprehensive estimates of total renewable energy investment volumes. But such techniques do not make it possible to accurately measure respective volumes of private and public finance, and of finance provided and mobilised by specific categories of public actors (multilateral, developed country or

developing country entities). The accuracy of the approach based on the commercial database is also uncertain. This is due to the nature of assumptions required to fill some data gaps (e.g. attributing finance equally among actors where that break down was not readily available) and the possibility that the data used results in an inaccurate representation of the public-private nature and geographical origin of finance.

The second approach results in highly inaccurate and likely over-estimates due to a current lack of empirically-robust publicly-available private finance leverage ratios. In particular, available ratios lead to double counting when used to estimate and report private finance mobilisation internationally across public finance providers. The ability to make more reliable extrapolations would require leverage ratios calculated based on attributing mobilised private finance among public actors. It would also require that ratios be disaggregated by e.g. types of public finance and instruments, technologies and recipient country income groups. On-going efforts by MDBs, DFIs and the OECD DAC to collect private co-financing and mobilisation data could facilitate the production of such improved ratios in future.

Despite these significant limitations, the study provides indicative insights in relation to private finance leverage ratios for renewable energy activities in developing countries. The estimation approach based on commercial data yielded average public to private finance leverage ratios of 1:1 for multilateral public finance and 1:0.7 for developed country bilateral public finance. These ratios were calculated by considering only projects with both public and private co-financing involved, and by then attributing private co-finance (all geographical origins) among public co-financiers involved using volume-based pro-rating. The ratios drop significantly if only private finance that was tentatively identified as originating from “developed” countries is included. However, this drop is likely in part due to the use of the location of the immediate provider of finance for assigning a country of origin to private finance. This, for instance, results in labelling finance provided by the local subsidiary (located in a developing country) of an international commercial bank as “domestic”. More generally, as noted by previous analyses, attempts to assign a country of origin to private finance might be very time-consuming without necessarily yielding meaningful results, especially in the context of international capital markets and financial flows.

The 1:1 and 1:0.7 ratios derived from the first approach based on commercial data do not significantly differ from the following publicly-available estimates of average leverage ratios across climate mitigation activities, project types, instruments, and recipient developing countries. In particular:

- Initial results by a group of developed country bilateral DFIs indicate an average private finance leverage ratio of about 1:0.4 for bilateral public climate finance (both concessional and non-concessional) over 2012-2014. This is based on voluntary reporting by participating institution, and on each claiming to have mobilised only an attributed share of, rather than total private finance where multiple public actors were involved. A reason explaining the relatively low ratio is that public finance considered includes a share that relates to project demonstration-, capacity building- or policy-interventions, where no private co-financing is typically involved directly.
- An initial pilot country-level consultancy study of private climate finance mobilised by the Netherlands in 2012, which despite being faced with significant data limitations, estimated an average private finance leverage ratio of 1:0.5. This is based on concessional and non-concessional bilateral public finance as well as public finance channelled through multilateral institutions. The same reasons than above apply to explain this relatively low average ratio.

E.S. Table 1. Partial (indicative) estimates based on commercial data for renewable energy investment projects in developing countries co-financed by both public and private actors during the period 2011-2014

| Categories of public finance considered | Public co-finance (average per year) | Mobilised private co-finance (average per year) * | Resulting private co-finance leverage ratio | Key current limitations | Advantages and potential for further use |
|-----------------------------------------|--------------------------------------|---------------------------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bilateral UNFCCC Annex I countries | USD 1.40 billion | USD 0.99 billion | 1:0.7 | Very partial volumes calculated based on 40% of deals recorded, for which a value is available. Uncertainties regarding the breadth of coverage and representativeness of the database used. Possible mischaracterisation of finance as public or private and of its geographical origin due to how the provider coded the data. | While incomplete, the database used remains at present the most extensive data source on renewable energy investments. Provides a basis for expanding the analysis to analyse drivers of private finance where no public co-finance is involved. |
| Multilateral institutions | USD 1.13 billion | USD 1.13 billion | 1:1 | | |

Source: amounts of public and mobilised private finance derived from Bloomberg New Energy Finance asset finance data for which a transaction value is disclosed.

* Calculated based on projects involving both public and private financiers by attributing private co-financing based on the respective volumes of finance provided by each public financier. Estimates include private finance from all geographical origins.

E.S. Table 2. Illustrative (inaccurate) estimates based on extrapolating 2011-2013 renewable energy-related public finance data based on publicly-available private finance leverage ratios

| Categories of public finance considered | Public finance (average/year) | Available private finance leverage ratios | Extrapolated mobilised private finance (average/year) | Key current limitations | Advantages and potential for further use |
|---------------------------------------------------|-------------------------------|-------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bilateral Official Development Assistance | USD 2.37 billion | 1:2.1 | USD 5.00 billion | Highly inaccurate and likely overestimation due to selection bias in absence of robust observed leverage ratios to break down the analysis per intervention type, sector, country income group. Double counting of mobilised private finance where activities were financed by two or more categories of public finance considered, as available ratios were calculated without attribution among public actors. | Practical approach in the absence of activity-level data on private co-financing. Potential to reduce uncertainty-level in the future if robust observed ratios become available. |
| Bilateral Other Official Flows | USD 0.65 billion | 1:1 to 1:9 | USD 0.65 to 5.85 billion | | |
| Multilateral Development Banks resources | USD 5.53 billion | Not available yet | - | | |
| Multilateral Development Banks external resources | USD 0.64 billion | 1:2.1 | USD 1.34 billion | | |

Sources: OECD DAC (bilateral Official Development Assistance and Other Official Flows data), joint-MDB reporting (multilateral public finance data), USAID (bilateral ODA leverage ratio), European Development Finance Institutions (bilateral OOF leverage ratios), and Climate Investment Funds (leverage ratio for multilateral external resources).

Note: In order to avoid double counting of public finance across bilateral and multilateral public finance datasets, volumes of ODA and OOF exclude bilateral contributions to multilateral banks and funds recorded by the OECD DAC. Bilateral ODA and OOF are for ODA-recipient countries. MDB finance is for countries eligible to receive funding from each institution, which for some of them include countries that are neither ODA recipients nor non-Annex I countries i.e. Russia and the new EU member states (EU13).

A number of past studies as well as estimates by development finance institutions have, however, indicated much higher leverage ratios for specific instruments, technologies, countries or finance providers. A part of the explanation is that such ratios were most often calculated by including all public and private co-financing. This is in turn because these ratios were not calculated with the intent to specifically measure mobilised private sector financing, or to inform its reporting at an international level across institutions and countries, for which the avoidance of double counting is a fundamental pre-requisite. Importantly, **wide variations in observed leverage ratios reflect the sensitivity of the mobilisation effect of public finance to core characteristics, which relate to the varying mandates of different development agencies and finance institutions.** Such characteristics relate in particular to whether public finance is provided as concessional or non-concessional (and corresponding instruments used), for capacity building or investments, to public or private recipients, and in low-, middle- or upper-middle-income countries.

The ability to use leverage ratios to make more robust extrapolations of mobilised private finance is therefore highly dependent on being able to break-down such an estimation approach to a level where ratios used match (at least some of) the core characteristics of the public finance they are being applied to. Even then, full transparency about the methodologies used and assumptions made (in particular in terms of attribution of private finance among public actors) to calculate such ratios is necessary to, if not avoid the risk of double counting, at least be able to identify and partly offset it.

Given the significant limitations identified in using commercial data or leverage ratios to derive estimates of mobilised private finance, this study highlights the need for improved primary data collection in order to be able to make more accurate and comprehensive estimates at an international level across countries and institutions. In this context, the collection and provision by public development finance institutions of data on private co-financing is an important step. Recent initial efforts by these institutions to collect such data have actually already made it possible for the OECD to, in the context of assessing progress towards the USD 100 billion a year goal, produce a first preliminary estimate of private finance mobilised by developed countries for climate action in developing countries. This estimate was based on the same methodological choices than those applied to the commercial data used for the present study: use of private co-finance data as best-available evidence of mobilisation, and attribution of mobilised private co-finance among public co-financiers using volume-based pro-rating.

In both cases, the analyses illustrate that collective reporting by groups of countries (e.g. “developed”) and public finance providers (multilateral, bilateral, domestic) could be considered. These analyses, however, point out that attribution at the activity level is necessary for assigning private finance identified as mobilised in a way that avoids double-counting between and within such groups. The issue of attribution therefore deserves more methodological work to explore alternatives to sole volume-based pro-rating. This could be done by taking into account the role played by each public actor (e.g. risk covered), although this may prove difficult to implement where different public finance instruments interact in jointly mobilising private finance.

Another area for further work relates to complementing activity-based monitoring and reporting of private co-finance mobilised directly with methods for estimating the indirect private finance mobilisation effect of public finance for project demonstration and capacity building as well as of public domestic public policies. Options for taking into account the further role played by broader market and country conditions should also be explored.

Finally, it is important to keep in mind that amounts of private finance mobilised by public actors and interventions (and leverage ratios that can be calculated on such basis) should not be interpreted as reflecting respective abilities to achieve effective and transformational climate action. Assessing the latter requires further monitoring and reporting of actual impacts, based on which conclusions could be drawn about how or where to provide future public support.

1. INTRODUCTION

As the international community seeks to scale up the delivery of climate finance globally, robust estimates and in-depth understanding of current volumes of climate finance can play a key role in informing public decision- and policy-making. Under the United Nations Framework Convention on Climate Change (UNFCCC), there is a particular need to assess progress towards the fulfilment of the commitment made by developed countries to mobilise USD 100 billion of climate finance per year by 2020 to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation. Such finance can come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources (UNFCCC, 2010).

The primary aim of this study, conducted under the OECD-led Research Collaborative on Tracking Private Climate Finance¹, is to test the extent to which currently available secondary data make it possible to address the part of this information need relating to measuring private finance mobilised by developed country public interventions. In doing so, the intent is to complement on-going efforts by a range of actors to define methods and collect better underlying primary data for estimating mobilised private climate finance. This includes notably:

- The methodological work and data collection undertaken by a group of multilateral development banks² (MDBs) and a group of bilateral development finance institutions³ (DFIs), to measure how much climate-related private finance they mobilise.
- A number of on-going pilot studies by individual developed countries of private finance they mobilise for climate action in developing countries.
- The OECD Development Assistance Committee's (DAC) work towards collecting activity-level data on amounts mobilised from the private sector by official development finance interventions⁴.

The present analysis takes a sector-level approach to estimating mobilised private finance, focusing on renewable energy. Renewable energy is the only climate-relevant subsector for which at least partial data on private finance can be extracted from existing data series (see Caruso and Jachnik, 2014), namely investment data reported in the Bloomberg New Energy Finance (BNEF) database. Recent reports on this subsector based on BNEF data have mainly focused on scaling investment and analysing market trends globally (UNEP - Frankfurt School, 2015; REN21, 2015; IEA, 2014; Buchner et al., 2014). This study focuses more specifically on estimating amounts of private finance mobilised to/in developing countries.

¹ See www.oecd.org/env/researchcollaborative.

² African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, European Investment Bank, Inter-American Development Bank, World Bank Group.

³ AFD (France), JICA (Japan), KfW (Germany), OPIC (United States), BIO (Belgium), CDC (United Kingdom), COFIDES (Spain), DEG (Germany), FINNFUND (Finland), FMO (Netherlands), IFU (Denmark), Norfund (Norway), OeEB (Austria), Proparco (France), SBI-BMI (Belgium), SIFEM (Switzerland), SIMEST (Italy), SOFID (Portugal), SWEDFUND (Sweden).

⁴ See www.oecd.org/dac/stats/mobilisation-effect-of-public-development-finance.htm.

The terms “mobilisation”, “leverage” and “co-financing” are sometimes used interchangeably when describing the relationship between public interventions and private finance (Hašič et al., 2015; Illman et al., 2014; Caruso and Ellis, 2013; Brown et al., 2011). Private co-financing is here used to define the amount of private financing associated with public interventions supporting a specific investment or project. Mobilisation is used to define the amount of private finance resulting from public interventions. Leverage is used for the ratio between the amount of mobilised private finance and the value of the public finance having led to this mobilisation. While the ability to measure private co-financing mainly depends on data availability, estimating mobilisation (and leverage) introduces the notion of causality between the public intervention and the amount claimed to have been mobilised as a result of this intervention.

The present analysis tests the implementation of two practical approaches for estimating renewable energy-related private finance mobilised by developed countries based on available secondary data. In doing so, the analysis provides transparency about methodological choices made, highlights current shortfalls, and assesses the level of robustness and completeness of resulting estimates. Conclusions drawn on this basis may inform on-going efforts to collect better underlying primary data and further develop estimation methodologies.

The first approach is based on analysing and aggregating individual BNEF transaction data. The second approach combines aggregate volumes of bilateral (OECD DAC data) and multilateral (joint-MDB reporting) public climate finance with leverage ratios made publicly-available by bilateral development agencies/finance institutions and multilateral development banks/funds. For both approaches, the study applies the framework developed by the Research Collaborative, which steps through key decision points for estimating publicly mobilised private climate finance (Jachnik, Caruso and Srivastava, 2015). Examples of decision points to be addressed include defining public and private finance, scoping private finance accounting boundaries, assessing causality (between public interventions and private finance) and deciding on an attribution method (where multiple public actors are involved). Stepping through these decision points makes it possible to highlight, in a transparent manner, methodological options used and their implications, in particular in terms of accuracy and the incentives they provide.

The scope of analysis includes six renewable energy sources as defined by the International Energy Agency (IEA): hydro-, solar-, wind-, marine-, geothermal-, and bio-energy (see Annex 1 and IEA, 2005). The bottom-up approach covers the period 2011-2014 (but has some limitations in terms of the size of projects included, as explained in Section 2), while the top-down approach is currently limited to the period 2011-2013 (pending the validation and release of 2014 OECD DAC data).

The paper is structured as follows:

- Sections 2 and 3 step through respectively the two approaches tested and present resulting partial estimates of private finance mobilised for renewable energy activities in developing countries, drawing attention to existing data gaps and methodological limitations.
- Section 4 puts forward conclusions on the potential use of these methods. Findings are also put in perspective with available/forthcoming results from related work and pilot studies of mobilisation by the OECD, public development finance institutions and individual countries.

2. TESTING THE USE OF COMMERCIAL DATA

The first approach is based on BNEF project- and transaction-level data. It involves two key steps. The first step is to analyse BNEF data to separate out deals involving public-private co-financing from those that were financed solely by either public or private finance. The second step consists in applying available practical options to estimate mobilised private climate finance within deals that feature both public and private co-financing.

2.1 Renewable energy investment data

BNEF data were reworked to separate out financial transactions that are specific to: (i) the six renewable energy sources: hydro-, solar-, wind-, marine-, geothermal-, and bio-energy; (ii) the 2011-2014 time period; (iii) projects implemented in developing countries. The full BNEF database increasingly covers projects in earlier years, developed countries, as well as, other climate-relevant sectors.

Though BNEF does not claim completeness, it remains to date the most extensive data source on investments in renewable energy. It monitors different types of financial transactions relating to renewable energy investments including asset (project) finance, corporate debt, venture capital and private equity investments, as well as grants⁵. Given the relationships between these different types of transactions along the financial value chain, some amounts might be included more than once. This might for instance be the case when an upstream equity investment at the fund or company level then participates in providing funding for a downstream asset-level investment. To avoid risks of double-counting (the BNEF database does not allow systematic netting out across datasets) and because asset finance represents more than 95% of the total value of transactions recorded by BNEF, only asset finance transactions are taken into account here⁶. Historical coverage for corporate debt and grants is anyway very limited, both in term of number of transactions and geographical areas. BNEF actually stopped tracking these two types of transactions in 2012 and 2013 respectively (Francis, 2015).

Certain challenges pertaining to the use of commercial databases such as BNEF can lead to relative underestimation of actual volumes of finance. A key challenge is the confidentiality of agreements surrounding transactions, for which financial information may not be disclosed or disaggregated by individual financiers (see Hašičič et al., 2015 for a more detailed discussion). This analysis could only include transactions for which a monetary value was available in the BNEF database. This is an important limitation of this method leading to a significant underestimation of volumes of finance given that less than 40% of asset finance-related transactions recorded by BNEF for renewable energy projects in developing countries include information on the associated monetary value, as further illustrated in Annex 2 and discussed in Subsection 2.3.

Another data challenge related to the BNEF database is that only renewable energy projects above/between certain size thresholds are tracked: biomass, waste-to-energy, geothermal and wind projects

⁵ BNEF also tracks mergers and acquisitions as well as public market operations, which are, however, not considered here due to the lack of clear definition of the source and destination of financial flows involved in the transactions (see Hašičič et al., 2015).

⁶ BNEF defines asset finance deals as “one or more investments (debt or equity) in a specific renewable energy generation project”.

above 1MW, hydropower projects between 1 and 50MW (i.e. small hydro only). Thus, small-scale transactions such as microcredits or household spending are not covered (largely due to the difficulty and resource-intensity in identifying and tracking such type of data); neither are large hydro projects. With regard to the latter, while they can result in net-emission reductions of greenhouse gases, their impacts on the environment and local communities (in particular with the construction of large dams) can in some cases lead to questioning their broader eligibility as environmentally- and socially-beneficial projects.

Projects financed by public institutions outside the above-mentioned thresholds are not accounted for here. This, again, results in under-estimates, in particular as such types of transactions can play an important role in developing countries (Guy, 2005). These challenges are not unique to BNEF and relate to varying degrees to all financial databases (see Caruso and Jachnik, 2014). As illustrated in Annex 2, data completeness is likely to vary more by financial transaction type than be an issue relating to a specific commercial data provider.

2.2 Methodology

Table 1 presents an overview of the methodological options used for each decision point of the Research Collaborative four-stage framework for estimating mobilised private climate finance. These options are illustrations of what was practical to implement in the short-term.

Table 1. Methodological options used under the approach based on BNEF data for each decision point of the Research Collaborative four-stage framework for estimating mobilised private climate finance

| Stages | Short description of methodological option used |
|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Define core concepts | <i>Climate change activities:</i> The DAC Rio marker (OECD DAC, 2011) and joint-MDB positive list of mitigation activities (Joint-MDBs, 2015) are used as reference points; both include hydro-, solar-, wind-, marine-, geothermal-, and bio-energy as climate mitigation activities. |
| | <i>Public and private finance:</i> Transactions reported by BNEF are classified as public and private according to the immediate ownership status of the organisations providing the financing. |
| | <i>Country classification as developed or developing:</i> The UNFCCC lists of Annex I and non-Annex I countries are used to classify countries as developed and developing respectively. |
| | <i>Geographical origin of private finance:</i> International and domestic sources of private finance are included but, to the extent possible, separated out by assigning a country of origin based on the immediate headquarter location principle. |
| 2. Identify interventions and instruments | <i>Type of interventions and instruments:</i> Asset finance-related public finance provided by developed countries (bilateral), multilateral banks and funds, as well as by developing countries (bilateral and domestic) are considered. Public policy interventions are not considered. |
| | <i>Specific instruments:</i> Public equity and debt transactions (as recorded in the BNEF asset finance dataset) are considered. BNEF does not systematically report on the use of other public finance instruments that might support asset finance deals, such as guarantees. |
| 3. Value public interventions and account for total private finance involved | <i>Currency and conversion:</i> BNEF converts all amounts in USD using the Bloomberg Foreign Exchange database exchange rate on the date of the announcement of the transaction. |
| | <i>Point of measurement:</i> BNEF does not per se differentiate between announcement, commitment and disbursement as it collects data from a wide array of both primary and secondary sources (self-submission from companies, press releases, investment agencies, etc.). |
| | <i>Value of public interventions:</i> Face value is used for all instruments considered. |
| | <i>Boundaries:</i> Accounting boundaries are defined as all direct private co-finance in asset finance transactions where at least one public actor is involved. |
| | <i>Data availability:</i> Partial project-level data on private finance is used as available from BNEF database. |

| Stages | Short description of methodological option used |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4. Estimate private finance mobilisation | <i>Causality:</i> Blanket causality between public finance and private finance is assumed within the above-defined accounting boundaries. |
| | <i>Attribution:</i> Amount of private finance mobilised are attributed among public finance providers by pro-rating based on respective volumes of public finance provided. |

Brief explanation of options used under Stage 1

- Defining climate-specific activities:* Difficulties in defining climate activities are inherent to sectors such as transport, agriculture or water but much less of an issue for renewable energy. The IEA defines the renewable energy sub-sector as consisting of six energy sources: hydro-, solar-, wind-, marine-, geothermal-, and bio-energy. The present approach considers these sources as climate mitigation activities, which is consistent with both the DAC climate mitigation Rio marker approach (OECD DAC, 2011) as well as the joint-MDB positive list of mitigation activities (Joint-MDBs, 2015). See Annex 1 for further details.
- Defining public and private finance:* Transactions are classified as private or public according to the immediate ownership status of the organisations providing the financing, which is the information available in the BNEF database. Transactions are thus considered public if funds are provided via government entities, state-owned enterprises, academic, public research foundations and public charities. The remaining transactions are considered private.
- Classifying countries as developed and developing:* Existing UNFCCC Annex I and non-Annex I lists are used to classify countries as developed or developing. These Annexes are anchored in historical circumstances and responsibilities but might not be flexible enough to reflect shifting realities towards providing an accurate picture of flows going to currently developing countries (Jachnik, Caruso and Srivastava, 2015). Alternative and more dynamic classifications based on country characteristics such as gross national income are available (from the World Bank in particular). See Annex 4 for further details and comparison of country classifications.
- Determining the geographical origin of finance:* A country of origin is assigned to financial transactions based on BNEF's tagging of the immediate headquarters' location of the entity providing the finance. Finance provided by multilateral entities are, however, analysed separately and not attributed to specific origin countries (see Hašič et al., 2015 for a more detailed discussion). While practical, the immediate headquarter location principle might not always provide a meaningful picture of the origin of private finance. Examples where using this principle may be misleading include public finance channelled through and recorded by the field offices of MDBs or bilateral aid agencies. The use of this principle can be further questioned for investments through offshore financial centres, financial sector intermediaries and special purpose entities (SPVs), as well as by multinational-enterprises associated with several geographies (Caruso and Jachnik, 2014). The specific case of SPVs (which are typically established in economies other than those in which the parent companies are resident) is, for instance, acute in the context of foreign direct investment statistics (OECD, 2014).

Brief explanation of options used under Stage 2

- Identify public intervention types and specific instruments:* This approach focuses on estimating mobilisation by direct public finance interventions tracked by BNEF in the context of asset finance renewable energy projects. Methods to estimate the indirect mobilisation effect of public finance targeting capacity building and of public policies are at this stage not developed enough

to be used in the context of this study. This should, however, not distract attention from the key role that such interventions play in mobilising private finance. Disregarding their mobilisation effect, along with the role of enabling environments, can lead to overestimating the mobilisation impact of public co-finance at the project level. It can, however, also result in underestimating total volumes of mobilised private finance, as private finance mobilised by capacity building and policy-related interventions in the absence of public co-finance will not be captured (Haščič et al., 2015).

2.3 Estimating total private co-financing

After defining core concepts and the scope of public instruments considered, Stage 3 of the framework focuses on valuing public interventions and estimating total private co-financing involved, which implied addressing the following decision points:

- *Currency conversion and point of measurement:* As shown in Table 1, BNEF reports all transaction in USD. The exchange rate is determined on the same day the transaction is recorded, which can be on the commitment, public announcement or disbursement date. It is not possible to identify or differentiate between these three points of measurements.
- *Value of public intervention:* This approach values equity and debt-related public finance instruments at their face value. While practical as it involves a standardised method across instruments, such an approach does not account for instrument specific characteristics. Other methods for valuing public finance instruments based on risk-return profiles or levels of concessionality could be considered moving forward pending on-going developments, in particular within the development finance community e.g. grant-equivalent-based valuation. Alternatively, such risk- and concessionality-related considerations can be used as a possible methodological basis for attributing mobilised private finance among public finance actors (see the “attribution” decision point under Stage 4 of the framework, discussed in Subsection 2.4 below).
- *Boundaries:* For every asset finance transaction in which both public and private financing is involved, total private co-finance is accounted for. Accounting for total private co-finance differs from the approach taken by the OECD DAC, which defines instrument-specific accounting boundaries according to the specificity of each instrument (OECD DAC, 2015). In this study, data limitations prevent analysing mobilisation on an instrument basis. However, as further explained in 2.4, attribution rules used here, make it possible to expand accounting boundaries to all private finance involved in each project without risking double counting. As the focus is on measuring the direct mobilisation effect of public finance instruments, transactions in which only private finance is involved are not taken into account. This excludes the role of public finance in indirectly mobilising private finance over time (spillover effect), as well as of policies (see Haščič et al., 2015 for further details).
- *Data availability:* As underlined in Subsection 2.1, BNEF data comprehensiveness is hampered by missing transaction values (60% for asset finance projects recorded in developing countries), the existence of size thresholds outside of which renewable energy projects are not tracked, as well as varying depth in the coverage of various countries and regions of the world. Where a transaction value is available, a further data and methodological issue is that BNEF often does not provide readily-available information about the specific portions of debt or equity provided by individual financiers. A pragmatic approach for addressing this issue is to allocate the total transaction value equally among actors involved i.e. if four actors are involved, each gets a quarter (see Haščič et al., 2015 for further details). By misrepresenting the true amounts of

finance provided by each public and private actor involved, this approach leads to significant uncertainties as regards the estimation results. It is, however, the only practical solution under current data limitations.

Based on those deals for which a monetary value is disclosed, this approach estimates total asset finance-related finance (both public and private) for renewable energy projects in non-Annex I countries between 2011-2014 at USD 165 billion i.e. an average of USD 41.3 billion per year. As per Figure 1 below, this total consists of considerably more private finance (USD 118.5 billion or 72%) than public finance (USD 46.5 billion or 28%).

If the monetary values of the 60% asset finance deals for which transaction values are missing were sized proportionally to the 40% for which values are available, pro rating up would result in an estimate of roughly USD 412.5 billion, or an average of about USD 103 billion per year. Such imputation would raise estimates much closer to the volumes of investments presented in the UNEP's annual Global Trends in Renewable Energy Investment report (UNEP, 2015) and the Renewable Energy Policy Network for the 21st Century's annual Renewables Global Status Report (REN21, 2015), which are based on BNEF. These two studies estimated total investments in renewable energy projects in developing countries between 2011-2014 at USD 424 billion, or USD 106 billion per year. Though information about the imputation methodology used to produce these estimates is not provided, it might have been based on combining known information about project size (typically megawatts) with assumptions about average technology costs and transport/installation costs in specific countries/regions.

While useful to scale overall volumes of finance and indicate trends, such imputation techniques and resulting extrapolation are not robust enough to serve as a basis for the next steps of the present study towards estimating private finance mobilised by specific categories of actors. This is because the BNEF database does not have information about how individual data entries were collected and quality-checked, and about why certain values are undisclosed, thus giving no further indication of the possible distribution of the 60% missing values. This implies that there is no robust basis to make and justify assumptions about the respective volumes of: (i) private versus public finance; (ii) public finance provided by multilateral, developed country or developing country entities.

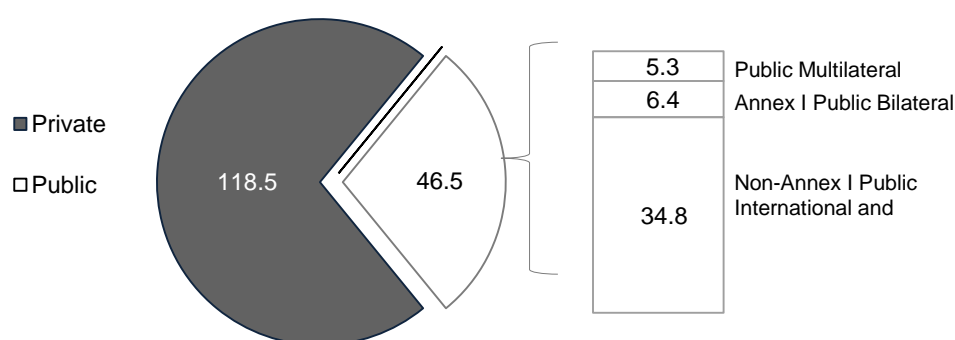
For those 40% deals for which values are available on, the provision of renewable energy-related public finance in support of renewable energy projects in developing countries is divided into three categories. These consist of bilateral (cross-border) Annex I, multilateral, and bilateral (cross-border/domestic) non-Annex I public finance.

- Bilateral public finance from Annex I to non-Annex I countries is estimated at USD 6.4 billion over the period 2011-2014 or an average of USD 1.6 billion per year. This is significantly less than estimates derived from DAC data (USD 3.02 billion per year including both concessional and non-concessional finance to ODA-recipient countries, see Subsection 3.1). This discrepancy can for a great part be explained by the issue of undisclosed transactions. But it is also due to the fact that bilateral public climate finance activities do not always relate to investment projects, which is the sole focus of the BNEF asset finance data). Further, investments-related activities financed by bilateral concessional finance can be small and thus below BNEF's 1MW threshold.
- Multilateral public finance non-Annex I countries is estimated at USD 5.3 billion over the period 2011-2014 or an average of USD 1.3 billion per year. Even more than for bilateral finance, this is very significantly below the yearly 2012-2013 average of USD 6.2 billion reported jointly by a

group of MDBs (Joint-MDBs, 2014, 2013⁷). This difference can, again, be explained by the issue of unavailable monetary value for 60% of asset finance transactions. Another key explanation is that MDB reporting includes recipient countries outside the non-Annex I list, and in particular Russia, Turkey and new EU member states (EU13⁸), which receive significant levels of financing from the European Bank for Reconstruction and Development and the European Investment Bank in particular. It is also worth noting again that BNEF does consider large hydropower projects as pertaining to renewable energy. Such projects can be included in joint-MDB reporting.

- Non-Annex I bilateral and domestic public finance is estimated at USD 34.8 billion or an average of USD 8.7 billion per year, representing about 76% of total asset finance-related public finance recorded by BNEF. This proportion is consistent with recent BNEF-based estimates by Climate Policy Initiative (Buchner et al., 2014) and OECD (Haščič et al., 2015) analyses, which, however, each cover different time periods. Chinese domestic but also bilateral public finance to other non-Annex I countries plays a significant role in this context. The latter point is well illustrated by Ghana’s first biennial update report (BUR) to the UNFCCC. It provides a summary of financial flows received by the country for the period 2011-2014, which highlights the predominance of incoming finance from China (UNFCCC, 2015).

Figure 1. Partial volumes of public and private finance for renewable energy projects in non-Annex I countries (USD billion for the 2011-2014 period)



Source: based on Bloomberg New Energy Finance asset finance data for which transaction values are available.

Next, it is necessary to identify projects co-financed by both public and private actors. Private co-financing, as defined in the introduction, refers to the amount of private financing directly associated with public financing at the level of a specific investment, project or activity. The aim here is to separate out projects that involve only public or private actors as such projects do not involve a possible direct causal relationship between public and private finance.

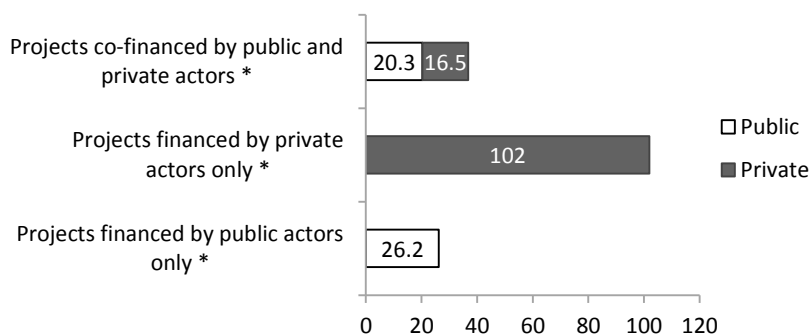
As displayed in Figure 2, this approach estimates that USD 36.8 billion of asset finance projects have been co-financed by both public and private actors, including USD 20.3 billion of public finance (originating from multilateral, Annex I and/or non-Annex I countries). It is within the boundaries of the

⁷ The USD 6.2 billion yearly average is based on joint-MDB 2012 and 2013 reporting. The initial joint-MDB report released in 2012 for 2011 data only included a figure for “energy” as a whole only (no break-down provided for “renewable energy”), while the 2015 report for 2014 data did not include a break-down between own and external resources for renewable energy.

⁸ Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

remaining USD 16.5 billion of private co-financing that the mobilisation effect of the USD 20.3 billion of public finance is then estimated.

Figure 2. Partial volumes of publicly and privately co-financed renewable energy projects in non-Annex I (USD billion for the period 2011-2014)



Source: based on Bloomberg New Energy Finance asset finance data for which transaction values are available.

* Volumes of public and private finance include all geographical origins (Annex I, non-Annex I and multilateral).

Although projects wholly financed by private actors are excluded from the next steps of the analysis (as are projects financed in whole by public actors), it is important to note that they are estimated to represent much larger volumes: USD 101.9 billion of private finance provided with no public co-finance. It is here important to note that a large share of “private only” relates to domestic finance in China (about 55%), and to a lesser extent domestic finance in India. In those two countries, renewable energy markets are quite well developed and supported by specific domestic public policies, which could explain why such large volumes of private finance are provided without known direct public co-finance.

The large share of “private only” might also be in part an overestimate resulting from a default data coding by BNEF (Louw, 2015), whereby 85% of asset finance transactions for renewable energy projects in developing countries are recorded as balance sheet financing (Caruso and Jachnik, 2014). Such default coding can in some instances “hide” that part of an investment was financed through debt (taking out of a loan or issuance of a bond by the project owner or developer), and can therefore have significant implications in terms of potential mischaracterisation of finance. This includes the risk of inaccurate labelling of specific financial transactions as public or private.

2.4 Estimating mobilised private co-finance

Estimating mobilisation is done in the fourth and final stage of the Research Collaborative framework. The two key decision points to be addressed are the assessment of causality between public and private finance within public-private co-financed projects, and the attribution of mobilised private finance.

- *Causality*: Blanket causality is assumed between public finance and all private co-finance within the accounting boundaries defined above. Using private-co-finance as best-available evidence of mobilisation is also the approach taken in the recently released report “Climate Finance in 2013-14 and the USD 100 billion goal” for estimating mobilised private finance (OECD, 2015). While practical, such assumption can lead to overestimating the mobilisation effect of direct public finance by disregarding the indirect mobilisation effect public finance (e.g. for project demonstration or capacity building) and of domestic policies (see Haščič et al., 2015 for an analysis of mobilisation including the latter). On the other hand, not accounting for indirect

effects will not make it possible to analyse and estimate the mobilisation of private finance in the absence of direct public co-finance, which as illustrated by Figure 2, appears to represent the majority of volumes.

- *Attribution:* Mobilised private finance is attributed among public actors involved (Annex I bilateral, multilateral and non-Annex I bilateral and domestic alike) based on the respective volumes of finance provided by each, which is a practical approach. More complex, but potentially more accurate attribution methods (e.g. taking into account risk-levels taken by individual public actors) would require analysing in detail information not available from the data at hand. Further, as highlighted in Subsection 2.3, BNEF does not attribute a specific portion of debt and equity to individual financiers. The unweighted fractioning method used to address this issue, which evenly splits total project cost among those involved, while practical, adds de facto a bias to volume-base attribution.

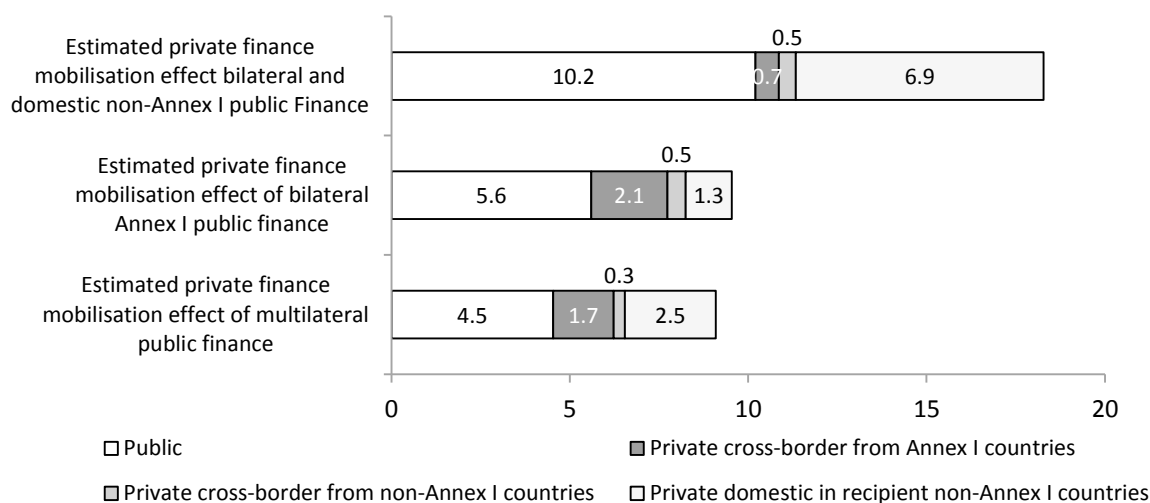
By definition, the blanket causality approach considers public finance to have mobilised all private co-finance within the accounting boundaries defined in Stage 3. Based on this assumption, volumes of co-financed projects presented in Figure 2 are translated in mobilisation terms: USD 20.3 billion of renewable energy-related public finance (multilateral, bilateral Annex I, bilateral and domestic non-Annex I) are considered to have mobilised USD 16.5 billion of private finance (both international and domestic) over the period 2011-2014.

The USD 16.5 billion are attributed among the three categories of public actors (Annex I countries, multilateral institutions, non-Annex I countries) involved in mobilising this amount, a volume-based pro rata attribution is used. Such an agreed-on and coherent attribution method is needed to prevent double counting where one or more of these categories of public actors are involved in jointly co-financing a project. About 25% of the deals recorded in BNEF between 2011 and 2014 for renewable energy projects in developing countries (40% of the total number of deals, for which a transaction value is available) feature more than one public co-financier. Looking at the ten largest projects (financial value) recorded further indicates that half of them were even co-financed by more than two public financiers. In the absence of an agreed-on coherent attribution method, such combination of large project values and multiple public finance institutions involved can lead to very significant volumes of mobilised private finance being counted more than once.

Results are presented in Figure 5, splitting amounts of mobilised private climate finance as originating from domestic sources in non-Annex I countries where projects were implemented, or as coming from abroad from either Annex I or other non-Annex I countries. In practice, such geographical assignment of private finance might be technically challenging and time consuming to make, without necessarily being meaningful (see Caruso and Jachnik, 2014 for further details). For instance, if the Brazilian subsidiary of an international commercial bank with global headquarters in the UK and mixed international shareholding participates in financing a project in Brazil, the immediate headquarter principle applied by BNEF (see “Determining the geographical origin of finance “under Subsection 2.2) leads to assigning the finance as originating from Brazil. While practical, it could be argued that using the immediate headquarter location results in mischaracterising the origin of private finance.

Presenting a break down in terms of both origin of public and private finance required analysing individual transaction data in order to first separate out public and private finance and then attribute amounts to one of the three categories. This implies that, irrespective of whether collective or individual reporting is chosen, an underlying analysis of private co-financing and attribution is needed at the individual activity-level. Further disaggregation of such analysis is then possible, such as presenting results by income groups as illustrated in Annex 5.

Figure 3. Partial estimated of volumes of private finance mobilised for renewable energy projects in non-Annex I countries, attributed by public finance source (USD billion for the period 2011-2014)



Source: based on Bloomberg New Energy Finance asset finance data for which transaction values are available.

Note: Attribution based on respective volumes of public finance provided.

For the period 2011-2014, the approach based on BNEF data estimates the following:

- A total of USD 4.5 billion of multilateral public finance mobilised USD 4.5 billion of private finance, which implies an average of USD 1.1 billion of private finance mobilised per year. 38% of this mobilised amount was assigned as coming from Annex I countries, 55% as being domestic finance in the recipient non-Annex I countries and 8% as coming from other non-Annex I countries. As underlined, this amount is likely a significant underestimate due to data limitations (60% of undisclosed transaction values in particular). This partial estimate estimates, however, suggest a leverage ratio of 1:1 when including all geographical of private finance (the ratio drops to 1:0.37 if including only private finance assigned as originating from Annex I countries). This ratio is slightly lower than the 1:1.6 ratio calculated by the Clean Technology Fund (CTF) of the Climate Investment Funds (CIF, 2014), which is the single multilateral actor to date having put forward a leverage ratio that only includes private finance. The CTF ratio is, however, based on considering all private co-financing involved rather than an attributed share only as done here. Much higher leverage ratios calculated by other multilateral actors typically also include other public co-financing, and are based on considering only projects that do feature private co-financing (see Section 3 for a detailed discussion on this).
- A total of USD 5.6 billion of Annex I bilateral public finance mobilised USD 3.9 billion of private finance, or, on average, just below USD 1 billion per year. 54% was assigned as coming from Annex I countries, 33% as being domestic finance in the recipient non-Annex I countries and 13% as coming from other non-Annex I countries. Similarly to multilateral financing, this volume should be seen as an underestimate. The resulting estimated leverage ratio can, however provide some insights: 1:0.7 when including private finance from all geographical origin (the ratio drops to 1:0.4 if including only private finance assigned as originating from Annex I countries). Such ratio is below the few publicly available private finance-specific leverage ratios put forward by bilateral development financial institutions that average between 1:2 and 1:9 (Meier and Haarstad, 2014 for USAID; EDFI, 2014). As for the CTF ratio above, an explanation is that the latters were calculated based on total private co-financing involved rather than an

attributed share of it, as well as based on considering only projects that do feature private co-financing (see Section 3).

- A total of USD 10.2 billion of non-Annex I bilateral and domestic public finance mobilised USD 8.1 billion of private finance, or, on average, USD 2 billion per year. As much as 85% was assigned as being domestic finance in the recipient non-Annex I countries, with volumes of international private finance mobilised being relatively much lower. The leverage ratio derived is 1:0.79 when including private finance from all geographical origin. It drops drastically (1:0.1) if including private finance assigned as originating from abroad. Further research could investigate the extent to which private finance considered here as having been mobilised by non-Annex I public finance, might have in part been indirectly mobilised by other types of international public finance interventions than direct co-financing at the project level. Examples of such type of interventions include budget support and capacity building grants and loans.

The volumes of private finance estimated as mobilised under the approach based on BNEF data are significant underestimates due to data limitations and in particular the fact that 60% of asset finance transactions recorded could not be included here due to missing transaction values. The resulting estimated public to private finance leverage ratios might, nevertheless, be indicative of a possible average mobilisation effect across public finance instruments, renewable energy technologies, and recipient countries. It is, however, important to keep in mind that they were derived based on default assumptions made to fill some of BNEF data gaps, in particular attributing finance equally among actors where that break down was not readily available.

3. TENTATIVE EXTRAPOLATIONS BASED ON LEVERAGE RATIOS

The second approach pursued by this study consists of a proxy method to extrapolate estimates of mobilised private climate finance based on combining:

- Available aggregate-level data on bilateral and multilateral public finance to developing countries for renewable energy activities; and
- Selected publicly available private finance leverage ratios observed by bilateral and multilateral finance institutions.

3.1 Data on public finance

Table 2 presents aggregate volumes of renewable energy-related bilateral and multilateral public development finance for the period 2011-2013. Volumes of bilateral finance were calculated by adding up relevant activity-level data recorded in the OECD DAC statistical system for renewable energy-specific sector codes⁹. Multilateral data was sourced at aggregate level from the yearly joint-reports released by a group of MDBs, which include a breakdown for renewable energy under “Mitigation Finance by Sector”.

- Between 2011-2014, yearly average public bilateral finance flowing from developed to developing countries for renewable energy is estimated at USD 2.37 billion for official development assistance (ODA i.e. concessional finance) and USD 0.65 billion for other official flows (non-concessional finance). The distinction between concessional and non-concessional bilateral public finance is meaningful in the context of the present analysis as ODA and OOF are likely to have varying private finance mobilisation effects. Volumes of OOF are likely a significant underestimate as not all DAC members currently report OOF comprehensively.
- Annual average of multilateral finance between 2012-2013 (the required data break-down for 2011 and 2014 is not unavailable) for renewable energy is estimated at USD 5.53 billion for “MDB resources” and USD 0.64 billion for “external resources” managed by MDBs. Examples of the latter include the Global Environment Facility (GEF) and the Climate Investment Funds (CIFs). However, in contrast to bilateral public finance data, the joint-MDB data does not make it possible to separately analyse volumes of multilateral finance provided under concessional versus non-concessional terms.

Risks of double counting between bilateral and multilateral public finance were avoided by excluding bilateral contributions to multilateral funds and banks recorded by the OECD DAC. The great majority is accounted for in the numbers reported by the MDBs taking part in the joint-MDB reporting.

⁹ Renewable energy-specific sector codes of the OECD DAC statistical system: 23030 Power generation/renewable sources; 23065 Hydro-electric power plants; 23066 Geothermal energy, 23067 Solar energy; 23068 Wind power; 23069 Ocean power; 23070 Biomass (See OECD DAC, 2013).

Table 2. Aggregate bilateral and multilateral public finance for renewable energy activities in developing countries (in USD billion commitments)

| Categories of public finance considered | 2011 | 2012 | 2013 | Yearly Average |
|-------------------------------------------------------------------------|-------------|-------------|-------------|----------------|
| Bilateral finance total * | 3.12 | 2.70 | 3.23 | 3.02 |
| Bilateral Official Development Assistance (concessional public finance) | 2.49 | 1.93 | 2.68 | 2.37 |
| Bilateral Other Official flows (non-concessional public finance) | 0.63 | 0.77 | 0.55 | 0.65 |
| Joint-Multilateral Development Banks reporting total ** | N/A | 7.51 | 4.82 | 6.17 |
| Joint-Multilateral Development Banks reporting (internal resources) | N/A | 6.76 | 4.30 | 5.53 |
| Joint-Multilateral Development Banks reporting (external resources) | N/A | 0.75 | 0.52 | 0.64 |

Source: OECD DAC CRS (2015); Joint-MDB 2012, 2013, 2014.

* Excluding bilateral contributions to multilateral funds and banks. Volumes are for activities and projects in ODA-recipient countries.

** For 2011, MDBs included Renewable Energy in the broader sector of Energy. Volumes are for countries eligible to receive funding from each institution, which for some of them include non-ODA recipients (Russia and new EU member states in particular).

There are some differences between the OECD DAC and the Joint-MDB data in terms of methodologies. For instance, DAC numbers are based on commitments while joint-MDB reporting on the time of board approval or financial agreement signature. More generally, the fact that joint-MDB data is currently not made available at the activity level prevents from making adjustments such as excluding finance provided by some MDBs to specific countries that do not qualify as “developing” under ODA-eligibility criteria (Russia and Russia and the new EU member states (EU13¹⁰) in particular) receiving financing from some of the MDBs.

However, on-going co-operations indicate that some degree of convergence between DAC and MDBs methodologies, as well as data integration is possible. Since 2014 (for 2013 data), the DAC is able to report combined comprehensive bilateral and multilateral public climate finance, thanks to gaining access to activity-level MDB data. This enables to systematically prevent risks of double-counting across bilateral and multilateral datasets. Such an integrated view will greatly facilitate future work and analysis.

Additional efforts are underway. In particular, a group of bilateral, national and regional development banks under the International Development Finance Club (IDFC) increased its effort to track climate finance (IDFC, 2014). IDFC data are not used here as they partly overlap with DAC data and also include finance provided domestically by developing country public institutions such as the Development Bank of Southern Africa (DBSA). However, information about the latter will be particularly useful moving forward to inform a more holistic measurement of private finance mobilisation than only focusing on public interventions by developed countries.

More generally, it is worth noting that the public finance split used here (i.e. bilateral ODA and OOF on the one hand, MDB own and external resources on the other hand) is just one approach to distinguishing different types of public finance. As underlined in the next subsection, public development finance institutions each have a distinctive mandate that has a direct influence on their investment strategy and relative ability to attract and mobilise private finance participation. For instance, finance provided by

¹⁰ Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

multilateral and bilateral finance institutions that focus on private sector investment projects (e.g. IFC, France's Proparco) might have more in common than with respective multilateral and bilateral institutions focusing mostly on the public sector (e.g. World Bank) and/or capacity building (e.g. Germany's GIZ).

3.2 Private finance leverage ratio

The second step of this approach involves reviewing publicly-available leverage ratios from bilateral and multilateral development finance institutions and funds to identify and select relevant ones for use as a proxy towards estimating mobilised private finance for renewable energy. Given the scope of the present study, the appropriateness of ratios relates in particular to whether they are specific to:

- private co-finance involved (rather than also including other public co-finance);
- renewable energy activities (rather than including projects in other sectors);
- ODA and OOF on the bilateral side, MDB own and external resources on the multilateral side (in order to match categories of public climate finance considered in Table 2 above).

In practice, a number of further characteristics relating to both the mandate of the institutions having calculated leverage ratios as well as the assumptions made when doing so, need to be reviewed in order to evaluate whether the ratios are appropriate for making robust extrapolated estimates of private finance mobilised. The mandate of each public finance provider will have a significant impact on its relative focus on and ability to directly attract and mobilise private co-finance. Such characteristics include in particular whether the institution provides concessional/non-concessional finance (and corresponding instruments used), extends finance for capacity building/investments, focuses on public/private recipients, and invests in low-/middle-/upper-middle-income countries.

In terms of assumptions and methodological choices underpinning leverage ratios, a key aspect is that such ratios can be calculated by public finance providers at different levels e.g. average across all activities, specifically for certain types of interventions/instruments or sectors/technology. Further, the numerator and denominator of the ratio can include or exclude different categories of public and private finance involved (see Ellis and Regan, 2012). Such choices have considerable impacts on the estimated results. In particular, average leverage ratios across a whole portfolio of sectors, financial instruments, and recipient countries cannot account for any particularities of contexts unless they are very carefully weighted. Using such ratios can thus result in large errors when extrapolating amounts mobilised at aggregate levels. Additionally, average ratios do not reflect country-specific public policies and broader enabling environments. Breaking down leverage ratios at country-level would for instance likely result in higher ratios where renewable energy-specific support policies are in place.

Table 3 provides an overview of some core characteristics of a sample of publicly-available ratios. This overview is based on a review of the public-availability of ratios from close to 40 bilateral and multilateral public finance institutions, building upon analyses conducted in recent years (Haščič et al., 2015; Illman et al., 2014; Caruso and Ellis, 2013; Brown et al., 2011). It highlights that only limited information is available about how leverage ratios were calculated by different institutions. It further underlines the lack of comparability and consistency between the different ratios, as well as the risk of multiple counting that would often occur if adding up amounts measured and reported as mobilised by each institution based on such definitions of leverage. This is because available information indicates that leverage ratios often account by default for total project costs, thereby including all private but also public co-finance. It is, however, important to note that the majority of publicly-available ratios reported to date were not calculated with the intent to specifically measure private sector co-financing, or inform measurement and reporting of private finance mobilisation at an international level.

Table 3. Overview and core characteristics of a sample of publicly- available leverage ratios from development finance institutions and funds

| Institution | Name of ratio as labelled by the institution | Estimated ratio | Time period covered | Private finance-specific ratio? | Renewable energy-specific ratio? | Type of financial interventions and instruments covered | Geographical coverage |
|-------------------------------------------------------------|----------------------------------------------|-----------------------------------|---------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Bilateral development finance institutions and funds | | | | | | | |
| EDFIs | Private capital leveraging ability | 1:1-1:9 | 2009-2013 | Yes (private sector investment/EDFI financing) | No (climate friendly energy projects; though renewables represent 70% in volume) | Equity, mezzanine finance, debt and guarantees for bankable projects and profitable businesses | All countries having received EDFI funding with a predominance of Latin America and Asia, and of middle-income countries |
| Norfund * | Leverage or Catalytic | 1:8-1:9 or 1:2-1:3 | 2007-2013 | No (other public and private capital/Norfund's capital) | No (All sectors) | Direct equity investments in companies and loans (mainly to financial institutions) | Selected countries in Central America, Southern Africa, East Africa and Southeast and South Asia |
| SIFEM | Additional finance leveraged | 1:4.6 to 1:15.9 depending on year | 2005-2013 | No (non-SIFEM investment/SIFEM investment) | No (All sectors) | Loans, fund-level and direct-equity investments | All eligible having received SIFEM funding |
| USAID | Leverage | 1:2.1 | 2001-2014 | Yes (private investment/USAID investment) | No (Energy) | Grants and concessional loans for public-private partnerships | All eligible countries having received USAID funding |
| Multilateral development banks and funds | | | | | | | |
| CIF Clean Technology Fund | Private finance leverage | 1:2.1 | 2008-2014 | Yes (total private finance/CIF funding) | No (renewable energy, energy efficiency, and transport) | Grants, concessional loans and guarantees channelled through MDBs for large-scale project demonstration and deployment | Focus on larger transactions in a limited number of middle income countries |
| EBRD Sustainable Energy Initiative | Leverage | 1:3.9 | 2006-2011 | No (total project cost/SEI** financing) | Yes (Renewable Energy, excluding large hydro) | Project-level technical assistance grants, concessional and non-concessional loans | Above 50 countries including close to 2/3 of volumes to Russia, Eastern and Southern Europe and the Caucasus |

Table 3 continued over page.

Table 3. Overview and core characteristics of a sample of publicly- available leverage ratios from bilateral and multilateral development finance institutions and funds

Continued

| | | | | | | | |
|-----------|--------------------------------------------|--------------------------------------------------|-----------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| GEF | Co-financing | 1:3.7 to 1:16.4 (depending on the technology) | 1991-2009 | No (non-GEF sources/GEF lending) | Yes (ratios for Solar Heating, off-grid photovoltaic, wind, geothermal, small hydro and biomass) | Relatively small grants and contingent loans for project preparation, project-risk mitigation, and investment capital costs | Close to 100 developing countries and economies in transition |
| IFC ** | Simple Leverage or Weighted leverage | 1:4.92 or 1:5.45) | 2005-2013 | No (project cost/IFC commitment OR total climate component/total IFC climate component)) | Yes (Renewable Energy) | Loans and equity on commercial terms for private sector investment projects | Investments in developing countries among IFC's 182 member countries |
| REEEP *** | Co-funding/Financial leverage | 1:2 | 2006-2014 | No (other funding/funding provided by REEEP) | No (renewable energy and energy efficiency) | Grants of between €150k to €300k | 58 countries with 60% of volumes in rapidly emerging economies of Brazil, China, India, Vietnam and South Africa |

Sources: Ingram and Biau, 2014; Meier and Haarstad, 2014; Norad, 2015; SIFEM, 2014; EDFI, 2014; CIF, 2014 ; IFC, 2013; GEF, 2009; Tanaka, 2012.

* The 1:2-1:3 estimated Norfund catalytic ratio was estimated based on the rough assumption that Norfund may have been catalytic in only around 30-40% of its investments (thus discounting the 1:8-1:9 observed leverage ratios).

*** The simple leverage is based on an average obtained by using totals across projects. This means that one or two large projects can unduly influence the result obtained, which is why IFC also calculated a weighted leverage.

*** Renewable Energy and Energy Efficiency Partnership (REEP) for, which Norway and Switzerland are currently the main donors.

Columns in Table 3 illustrate a few core assumptions and other characteristics embedded in any ratio calculated by individual institutions and the difficulty in collecting reliable and comprehensive information about these characteristics. Because any robust extrapolation requires using ratios that match (at least some of) the core characteristics of the public finance volumes they are being applied to, such information is, however, necessary. As a starting point to making tentative estimates of mobilised private finance in the context of the present study, only ratios calculated on the basis of considering solely private co-finance can be used i.e. excluding public co-financing. This already drastically reduces the number of ratios at hand even before looking at whether any of the other characteristics of the ratios make some of them fit for the present purpose.

As regards to public bilateral finance, publicly-available private finance leverage ratios were found to be available for only two cases (out of 26 institutions reviewed in total):

- *Bilateral ODA*: The Brookings Institution estimated a public-private finance leverage ratio of 1:2.1 for USAID's energy-related public-private partnership projects worldwide over the period 2001-2014 (Ingram and Biau, 2014). Financial assistance provided by USAID in this context typically consisted of grants and concessional loans, which are representative of the financial instruments used for the majority of climate-related ODA recorded in DAC statistics to date. Although covering the "energy" sector altogether rather than being specific to renewable energy, this ratio remains the best available option for now. However, the inclusion of conventional energy projects (i.e. typically based on mature technologies) in the calculation might lead to overestimating leverage for renewable energy projects. A more important reason for which the 1:2.11 is very likely to overestimate of the average impact of ODA is due to a strong selection bias. The ratio was calculated by specifically looking at PPP projects rather than across USAID's full portfolio of activities. PPPs only represent a minority of bilateral ODA activities (OECD DAC, 2015).
- *Bilateral OOF*: The 15 institutions part of the European Development Finance Institutions (EDFIs) estimated private finance leverage ratios ranging from 1:1 to 1:9 for private sector "bankable, profitable" climate friendly energy projects (EDFI, 2014). At least 70% of the underlying volumes of finance went to renewable energy (the remaining 30% being labelled as "Other"), thus making the ratios relevant to the scope of the present analysis. Half of the finance provided by EDFI institutions consisted in equity investments, with the remaining taking the form of other financing instruments such as subordinated debt and guarantees. This can be considered as representative of the nature of OOF. The 1 to 9 variance between the lower and upper bound reflects the fact that ratios vary significantly between specific public finance instruments-, countries-, and/or technologies. The present aggregate-level estimation approach would require the use of leverage ratios coinciding with a weighted average across these characteristics. In the absence of such ratio, a lower- and upper-bound has to be considered.

For public multilateral finance, only one private finance leverage ratio was identified:

- *MDB external resources*: the Climate Investment Funds' (CIFs) Clean Technology Fund (CTF) 1:2.1 ratio is the only private-specific publicly-available leverage ratio available (CIF, 2014). It is based on observed private co-financing for approved projects up to mid-2014 across instruments and climate-relevant sectors (renewable energy, energy efficiency, and transport) in which the CTF finances projects. Three-quarters of the volumes of finance extended up to 2014, however, went to renewable energy, with only 14% to energy efficiency and 11% to transport (Duarte, 2014), thus making the ratio relevant to the present analysis. The ratio consists of a weighted average between a higher ratio for private sector projects (1:3.4) and a lower one for public sector projects (1:1.6). It is important to note the CTF focuses on relatively large projects

in middle-income countries, which can typically be expected to attract more private finance participation than relatively smaller projects and activities in lower-income countries. This is well illustrated by the absence of observed private sector co-financing for projects approved up to mid-2014 under the CIF's Scaling-Up Renewable Energy Program (SREP), which focuses on lower-income countries (CIF, 2014). This selection bias towards middle-income countries likely leads to an overestimate of private finance mobilised when applying the CTF ratio to the full public finance volume of MDB external resources.

- *MDB resources*: the review of publicly-available information did not make it possible to identify a private finance specific leverage ratio for MDBs own resources. As illustrated in Table 3 for IFC and EBRD, existing MDB leverage ratios that are publicly available were, calculated on the basis of including other public co-financing in addition to private. On-going efforts by MDBs and public finance institutions more broadly to collect private co-financing and mobilisation data should improve the availability of robust leverage ratios moving forward.

3.3 Methodological overview

Table 4 presents methodological options used for each decision point of the four-stage framework. As for the first approach, these options should be seen as illustrations of what might be practical to implement in the short-term. Options used for some decision points are identical to the first approach, in which case no further explanation is provided. Many of the options used are, however, rather a default result of default characteristics embedded in the data (DAC and joint-MDB) and leverage ratios used, rather than active methodological choices.

Brief explanations of options used under Stage 1

- Defining climate-specific renewable activities: Same as for the first approach.
- Defining public and private finance: Same as for the first approach.
- *Classifying countries as developed or developing*: The OECD DAC and MDBs joint reporting initiative use their own classification in terms recipients of finance. The OECD DAC categorisation of eligible recipients builds upon the World Bank's income group categorisation. The most notable difference with the list of recipient countries used by MDBs for their joint reporting is the inclusion of 13 European Union member countries, as highlighted in Annex 4.
- *Determining the geographical origin of finance*: Using private finance leverage ratios, it is not possible to analyse the geographical origin of private flows to separate international and domestic sources. All geographical sources of private finance are therefore included in the estimation.

Table 4. Options used under the estimation approach based on leverage ratios for each decision point of the Research Collaborative four-stage framework

| Stages | Short description of methodological options used |
|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Define core concepts | <i>Climate change activities:</i> The DAC Rio marker (OECD DAC, 2011) and joint-MDB positive list for mitigation activities (Joint-MDBs, 2014) are used as reference points; both define small hydro-, solar-, wind-, marine-, geothermal-, and bio-energy as climate mitigation activities. |
| | <i>Public and private finance:</i> Consistently with the DAC statistical directive (OECD DAC, 2013) transactions are considered public when undertaken by public entities at their own risk and responsibility. Other transactions are considered private. |
| | <i>Country classification:</i> The respective countries listed as recipients by the DAC and the joint-MDB reports initiatives are used to classify countries as developing. The list of DAC members is used to classify countries as developed, while MDBs are not assigned to a source country. |
| | <i>Geographical origin of private finance:</i> International and domestic sources of private finance are included as currently available leverage ratios do not make such distinction. |
| 2. Identify interventions and instruments | <i>Type of intervention and instruments:</i> Public finance instruments from developed countries and multilateral development banks are considered. |
| | <i>Specific instruments:</i> DAC: grants, loans (concessional and non-concessional), equity; MDBs: grant, loan, guarantee, equity, performance-based instruments |
| 3. Value public interventions and account for total private finance involved | <i>Currency and conversion:</i> Volumes of finance are reported by DAC and MDBs in USD. |
| | <i>Point of measurement:</i> DAC and MDBs records transactions respectively at commitment and board approval/financial agreement signature dates. It should be noted that MDBs report on the basis of fiscal years and the OECD DAC on the basis of calendar years. |
| | <i>Value of public interventions:</i> Face value is used for all instruments considered. |
| | <i>Boundaries:</i> Accounting boundaries cover all private finance involved at the project-level as defined by the selected private finance leverage ratios used. |
| | <i>Data availability:</i> Transaction-level data for bilateral public finance and aggregates for MDB finance are used; only a very limited number of appropriate leverage ratios are available. |
| 4. Estimate private finance mobilisation | <i>Causality:</i> Existing publicly-available leverage ratios were calculated assuming blanket causality between public and private co-finance. |
| | <i>Attribution:</i> Existing publicly-available leverage ratios were calculated based on total private finance involved. No attribution to individual entities/public interventions is, therefore, possible. |

Brief explanations of options used under Stage 2

- *Identify public intervention types and specific instruments:* The calculation behind the leverage ratios used is based on observations of co-financing. As a result, similarly to the first approach, this approach focuses on estimating mobilisation by direct public finance interventions. It does not take into account instances where private finance occurred without direct public co-finance being involved.

Brief explanations of options used under Stage 3

- *Value of public intervention:* Same as for the first approach.
- *Boundaries:* This approach accounts by default for all private finance associated with each public finance instrument, as measured by each of the private finance leverage ratios used. As such, this is a consequence of the use of leverage ratios rather than an active methodological choice.

- *Data availability:* Data quality on bilateral and multilateral public finance to developing countries is good, although further data granularity would be needed from the joint-MDB reporting in order to be able to break down the present analysis further e.g. respective volumes of concessional and non-concessional finance. Further, there is at present very limited information available about how public development finance institutions gather co-financing data and about the way they then use this information to calculate co-financing and/or leverage ratios. This limitation considerably reduces the number of publicly-available ratios that can be meaningfully used for deriving estimates on a larger scale as intended in the present study.

3.4 Estimating mobilised private finance

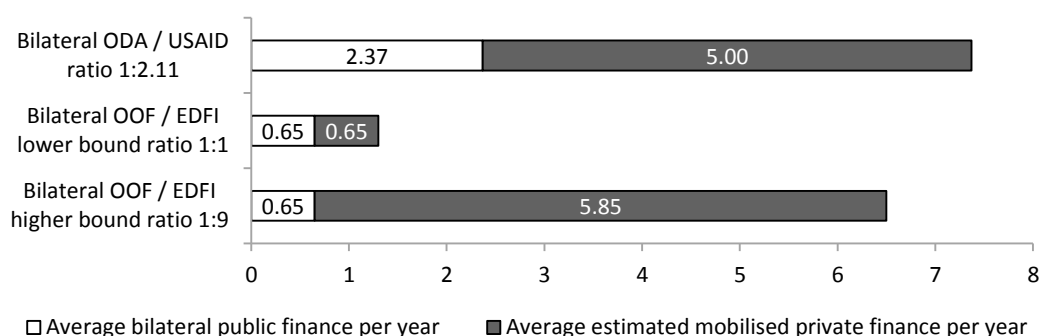
The two key and final decision points to be addressed for estimating mobilisation are the assessment of causality between public and private finance, and the attribution of mobilised private finance among public actors/interventions involved.

- *Causality:* Similar to the first approach, public finance interventions are, under a blanket causality assumption, considered as responsible for mobilising all private finance determined within the default accounting boundaries (Stage 3 of the framework) relating to the private finance leverage ratios used. Based on this assumption, the full amount of private finance estimated based on those ratios is considered to have been mobilised. The same limitations as highlighted in the first approach in terms of not capturing the indirect mobilisation effect of capacity building, budgetary support and domestic policies.
- *Attribution:* By using private finance leverage ratios as proxies, it is not possible to attribute mobilised private finance. This is due to bilateral and multilateral institutions for which leverage ratios are at present publicly available having attributed to themselves all private finance involved when calculating such ratios¹¹. Thus, there will be multiple counting between amounts estimated as mobilised respectively by bilateral ODA, bilateral OOF, MDB own resources, and MDB external resources in cases where two or more of these different categories of public finance were involved in financing the same activity. Further, such approach disregards the role played by developing country public finance institutions, both domestic (such as national funds and development banks) and bilateral, which also finance projects, including sometimes together with MDBs/developed country bilateral finance institutions.

Applying bilateral and multilateral ratios selected in Subsection 3.2 to aggregate volumes of public bilateral ODA and OOF, and of MDB external resources, as presented in Subsection 3.1, estimates of mobilised private finance for renewables in developing countries can be derived. These are presented in Figures 4 and 5. Figure 5 does not include an estimate for private finance mobilised by MDB own resources due to no suitable publicly-available private finance ratio having been identified.

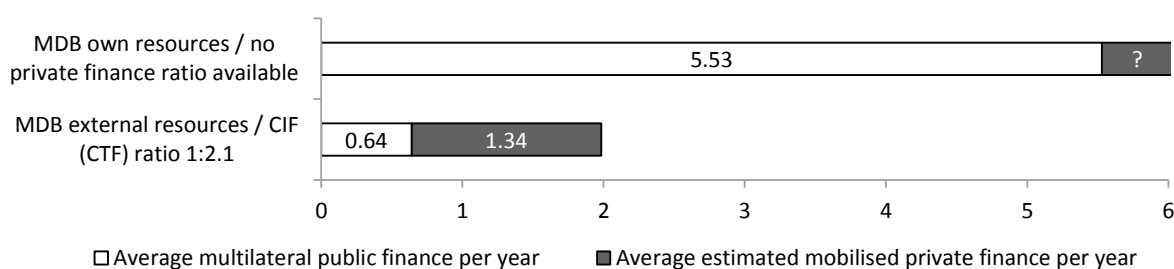
¹¹ Some institutions/actors might already calculate amounts of private finance they mobilise and resulting leverage ratios based on only attributing a share of total private finance involved to themselves; these institutions, however, do not currently make such information publicly available.

Figure 4. Indicative extrapolation of private finance mobilised by bilateral ODA and OOF for renewables in developing countries (USD billion average per year for the period 2011-2013)



Source: based on OECD Development Assistance Committee (OECD, 2015), Ingram and Biau, 2014; European Development Finance Institutions (EDFIs, 2014).

Figure 5. Indicative extrapolation of private finance mobilised by multilateral public finance for renewables in developing countries (average per year for the period 2012-2013)



Source: based on Multilateral Development Banks Joint reporting (MDBs, 2014, 2013), Climate Investment Funds (CIF, 2014).

Based on the assumptions outlined above, this approach estimates that:

- USD 2.37 billion of renewable energy-related bilateral ODA (2011-2013 annual average) mobilised USD 5.00 billion of private finance to and in developing countries per year on average. However, as highlighted in Subsection 3.2, the use of the USAID ratio (calculated specifically based on USAID PPP energy projects) very likely leads to a significant overestimation of the average mobilisation effect of bilateral ODA.
- USD 0.65 billion of renewable energy-related bilateral OOF (2011-2013 annual average) mobilised between USD 0.65 billion and USD 5.85 billion per year on average. Such a wide range is due to the use of lower- and upper-bound ratios, thereby illustrating the high degree of uncertainty of using such an approach under current conditions of data availability.
- USD 0.64 billion of renewable energy-related MDB external resources (2012-2013 average) mobilised USD 1.34 billion of private finance to and in developing countries per year on average. No equivalent extrapolation could be made for MDB based on MDB own resources (USD 5.53 billion average between 2012 and 2013) due to the absence of suitable private finance leverage ratios having been identified for the time being.

In terms of using the approach based on leverage ratios to produce transparent and robust estimates of mobilised private finance at an international level (i.e. across relevant public actors and institutions), the

method is at this stage far too inaccurate. This is due to two core issues with existing publicly available private finance leverage ratios.

Firstly, they are calculated by accounting for all private co-finance rather than based on attributing this finance among public actors involved. Using such ratios for extrapolating total volumes of mobilised private finance will lead to systematic double counting where one or more of the public finance categories considered (here bilateral ODA and OOF, MDB own and external resources) were involved in financing the same activity or project. More generally, the issue of double counting arises in the absence of attribution where multiple public actors are involved. As mentioned in Subsection 2.3, about one-fourth of deals recorded in BNEF considered under first approach feature more than one public financier involved, with, for the largest projects, an increased likelihood to have more than two.

Secondly, the very limited number of suitable private finance ratios currently available does not make it possible to break-down the analysis to a level that would make it more robust by enabling to match the selected ratios with the characteristics of the public finance volumes they are being applied to. This would require having suitable ratios at hand for, in particular, sub-sectors, types of public finance providers/instruments, and recipient countries income-groups. The ability to break-down the analysis is a condition to making the leverage ratio-based approach tested here more robust in the future. Next steps in this direction should also include taking into account public finance provided by developing countries, which also play a role in mobilising private finance.

These issues could be resolved moving forward if public finance institutions progressively develop the ability to calculate more specific private finance leverage ratios, along with fully transparent information about those were calculated. Agreed-on common methodologies would be further needed for defining accounting boundaries and attributing private finance among public actors, or at least categories of public actors involved, in a way so as to avoid double counting.

4. IMPLICATIONS AND RECOMMENDED ACTIONS

This study explored and tested two different approaches to estimate private finance mobilised for renewable energy-related projects in developing countries:

1. A first approach based on the BNEF asset finance database of investments in renewable energy yielded very partial estimates of yearly average volumes of private finance mobilised by bilateral and multilateral public finance for projects in developing countries. These are significant underestimates due to data limitations and in particular the fact that 60% of the number of asset finance transactions recorded in the database used did not have an associated transaction value. The accuracy of results is also uncertain. This is due to the nature of assumptions required to fill some data gaps (e.g. attributing finance equally among actors where that break down was not readily available) and uncertainty as to whether the data used result in an accurate representation of the public-private nature and geographical origin of finance.
2. A second approach combined aggregate public climate finance data from the OECD DAC statistical system (bilateral ODA and OOF) and joint-MDB reports (MDB own and external resources) with currently available private finance leverage ratios made publicly-available by development finance institutions. Because of the scarcity of appropriate ratios (e.g. specific to renewable energy) and a lack of detailed information about the underlying methods used to calculate them, this approach results for the time being in highly uncertain and inaccurate results. It is also characterised by systematic but as yet unquantified double-counting where two or more categories of public finance were involved in financing the same activity or project.

Beyond the estimated volumes, which should only be considered as indicative for both approaches, the approach based on BNEF data yielded estimated private finance average leverage ratios of 1:1 for multilateral public finance and 1:0.7 for Annex I bilateral public finance, considering both international and domestic private finance. These results are sensitive to the aforementioned data gaps and methodological assumptions relating to the BNEF database. However, the ratios are not out of range compared to the following publicly-available estimates of average aggregate public-private leverage ratios across climate mitigation activities, project types, financial instruments, and recipient developing countries:

- Initial results by a group of developed country bilateral DFIs indicates an average private finance leverage ratio of about 1:0.4 for bilateral public climate finance (both concessional and non-concessional) over 2012-2014. (Stumhofer et al., 2015). It is important to note that this is based on voluntary reporting by participating institutions, and on each institution claiming to have mobilised only an attributed share rather than total private finance involved in any given project where multiple public actors were involved. A reason explaining the relatively low ratio is that public finance considered includes a share that relates to project demonstration-, capacity building- or policy-interventions, where no private co-financing is typically involved directly.
- An initial pilot country-level consultancy study of private climate finance mobilised by the Netherlands in 2012, which despite being faced with significant data limitations, estimated an average ratio of 1:0.5. This is based on both bilateral public finance concessional and

non-concessional and public finance channelled through multilateral banks and funds (Bolscher, Veenstra and van der Laan, 2014). The same reasons than above apply to explain this relatively low average ratio.

A number of past studies (Smallridge et al., 2012; AGF, 2010; Caperton, 2010) as well as estimates put forward by development finance institutions (IFC, 2013; EBRD, 2012; Tanaka, 2012) have, however, indicated that ratios for specific instruments, technologies, countries or finance providers might be much higher. A part of the explanation is that such ratios were most often calculated by including all public and private co-financing. This is in turn because these ratios were not calculated with the intent to specifically measure mobilised private sector financing, or to inform its reporting at an international level across institutions and countries, for which avoiding double counting is a pre-requisite. Importantly, wide variations in estimated leverage ratios also reflect that the mobilisation effect of public finance is uneven and will differ significantly depending on certain core characteristics, which are determined by the varying mandates of different development finance institutions. Such characteristics relate in particular to whether the finance is provided as concessional or non-concessional (and corresponding instruments used), for capacity building or investments, to public or private recipients, and in low-, middle- or upper-middle-income countries.

Given the significant limitations identified in using secondary (commercial) data or leverage ratios to estimate mobilised private finance, this study highlights the need for better primary data to make more accurate and comprehensive estimates across countries and institutions. This includes in particular improved data collection by public finance institutions on private co-financing, building upon the recent progress already achieved by a number of MDBs and bilateral DFIs. Combined with harmonised methodological developments to estimate and attribute mobilisation, improved primary data could by extension result in more robust co-financing and/or leverage ratios. In turn, these more robust ratios could be used where and when activity-level data might still be missing in the future. The ability to use such ratios to make reliable and transparent extrapolations is, however, dependent on being able to disaggregate the leverage ratio-based approach to a level where ratios being used can match (at least some of) the aforementioned core characteristics of the public finance they are being applied to.

Further, the issue of attributing mobilised private finance to specific actors requires additional work. Collective reporting by groups of countries (e.g. “developed”) and public finance providers (multilateral, bilateral, domestic) could be considered (it is here important to note that in the specific context of the UNFCCC, there is at present no provision for non-Parties to report to the Convention). Some degree of attribution, however, remains necessary for sharing total private finance identified as mobilised in a way that avoids double-counting between and within such groups. Pro-rata attribution of mobilised private finance to public actors involved in financing the same activity based on the respective volumes of finance provided by each was used here under the approach based on BNEF data as well as in the recent “Climate Finance in 2013-14 and the USD 100 billion goal” report (OECD, 2015). Although practical, this method is not necessarily always accurate as it does not take into account important features relating to, in particular, risk and concessionality levels of respective public finance interventions.

As suggested by the on-going work of the OECD DAC towards measuring private finance mobilised by official (public) development finance interventions, an instrument-specific approach to attribution (and causality) is likely to increase accuracy. Such an approach may, however, be difficult to implement in practice in situations where multiple public finance instruments interact in jointly mobilising private finance. As regards the approach based on leverage ratios, currently available ratios were calculated based on total private co-financing involved, not taking into account the possible presence of other public finance providers. Such ratios preclude attributing mobilised climate finance among public actors and leads to double-counting in instances where multiple public financiers co-finance the same projects. They also

disregard the mobilisation effect of developing country public finance institutions where those are involved in co-financing an activity.

On-going efforts by bilateral and multilateral public finance institutions, countries, and the OECD DAC to estimate mobilised private climate finance will progressively improve data availability and methodological transparency. Similarly to the recent “Climate Finance in 2013-14 and the USD 100 billion goal” report (OECD, 2015), they will provide empirical evidence of relative volumes of private co-finance as well as of private finance estimated as mobilised (based on transparent causality assumptions). Results from these complementary pilot studies will further highlight the types of climate activities and public finance interventions for which it is possible to at least partially report mobilised private climate finance in the short term. Where so, these results will inform on the level (individual versus groups of countries and institutions) at which such reporting can remain practical while ensuring a high degree of accuracy.

Findings from these pilot studies will also facilitate the identification of next steps towards improving data coverage and methodological convergence. This could for instance be achieved through a progressive integration of data on private finance mobilised by bilateral and multilateral development finance institutions in the OECD DAC statistical system, which already captures public finance from these two types of channels. Such developments could in turn help to progressively build trust internationally, including among Parties to the UNFCCC that progress is being made towards estimating and reporting mobilised private climate finance in a robust and transparent manner.

It is, however, important to note that such on-going efforts focus on measuring direct private finance mobilisation for projects and activities that public and private actors jointly contribute to financing. The indirect mobilisation effect of other types of public interventions (finance for project demonstration or capacity building, technical assistance, domestic public policies) and the catalytic role played by broader enabling environments are not accounted for in such estimates of direct mobilisation. This important limitation means that, on the one hand, private finance invested in the absence of direct public co-financing is de facto excluded from estimations, leading to underestimating total volumes of private finance mobilised by public interventions. On the other hand, disregarding indirect mobilisation effects can lead to overestimating the direct mobilisation effect of public co-finance provided at the activity/project level.

Importantly, different types of public actors providing or channelling finance have different aims. This means their focus on directly mobilising private finance (rather than on e.g. capacity building or technical assistance) may also differ. Further, mobilised private co-finance and leverage ratios that can be derived from these should, as such, not be interpreted as reflecting respective abilities of these actors and of various categories of public finance to mobilise private finance for effective climate action, which requires further monitoring and reporting of actual impacts. Thus, mobilised private co-finance and resulting leverage ratios are, on their own, not necessarily appropriate for drawing conclusions about how or where to provide and channel future public finance.

ANNEX 1: DEFINING RENEWABLE ENERGY RELATED ACTIVITIES

The renewable energy sub-sector is defined by the International Energy Agency as consisting of six sub-groups (hydro-, solar-, wind-, marine-, geothermal-, and biomass-energy):

| | |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Solar- | Solar energy is the conversion of sunlight into usable energy forms. Solar photovoltaics (PV), solar thermal electricity and solar heating and cooling are well established solar technologies. |
| Wind- | Wind energy is kinetic energy of wind exploited for electricity generation in wind turbines, with land-based and offshore wind energy. |
| Marine- | Ocean power encompasses five different types of technologies that exploit the following phenomena: tidal rise and fall (barrages), tidal/ocean currents, waves, temperature gradients, and salinity gradients. |
| Hydro- | The electrical energy derived from turbines being spun by fresh flowing water. This can be from rivers or from man-made installations, where water flows from a high-level reservoir down through a tunnel and away from a dam. |
| Geothermal- | The energy available as heat emitted from within the earth’s crust, usually in the form of hot water or steam. |
| Biomass- | The renewable energy from living (or recently living) plants and animals; e.g. wood chippings, crops and manure. Plants store energy from the sun while animals get their energy from the plants they eat. |

Source: International Energy Agency glossary, 2005).

The following renewable energy projects are included in the analysis: all biomass and waste-to-energy, geothermal, and wind generation projects of more than 1MW; all hydropower projects of between 1MW and 50MW; all wave and tidal energy projects; all biofuel projects with a capacity of one million litres or more per year. Renewable energy Research & Development and manufacturing is excluded, i.e. the production of equipment for renewable energy generation. The former because it might not ultimately result in emission reductions, while the latter because of double counting issues and difficulties in attributing it to a specific source of funding.

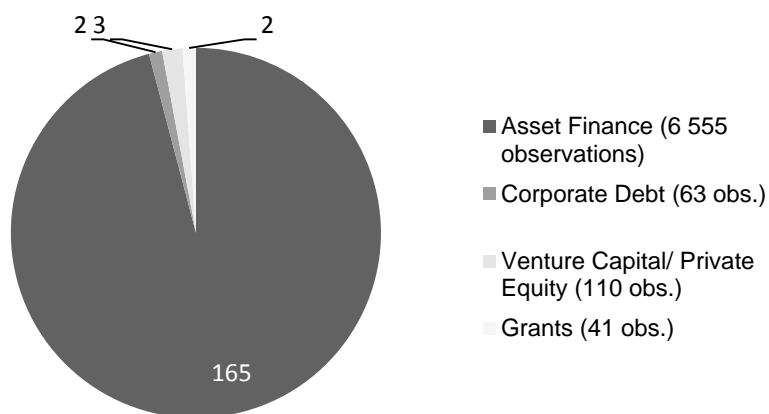
Both the OECD DAC and Multilateral Development Banks (MDBs) consider the six aforementioned renewable energy power sources as climate-specific by nature:

| | Joint MDB | OECD DAC Rio markers |
|------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Renewable Energy | 4.1.1. Wind power | GHG emission reductions or stabilisation in the energy industry through application of new and renewable forms of energy |
| | 4.1.2. Geothermal power | |
| | 4.1.3. Solar power | |
| | 4.1.4. Biomass or biogas (that does not decrease biomass and soil carbon pool) | |
| | 4.1.5. Ocean power (wave, tidal, ocean currents, salt gradients, etc.) | |
| | 4.1.6. Hydropower plants (if net reductions can be demonstrated) | |

Source: adapted from the joint-MDBs report (2013) and the Handbook on the OECD-DAC Climate Markers (2011).

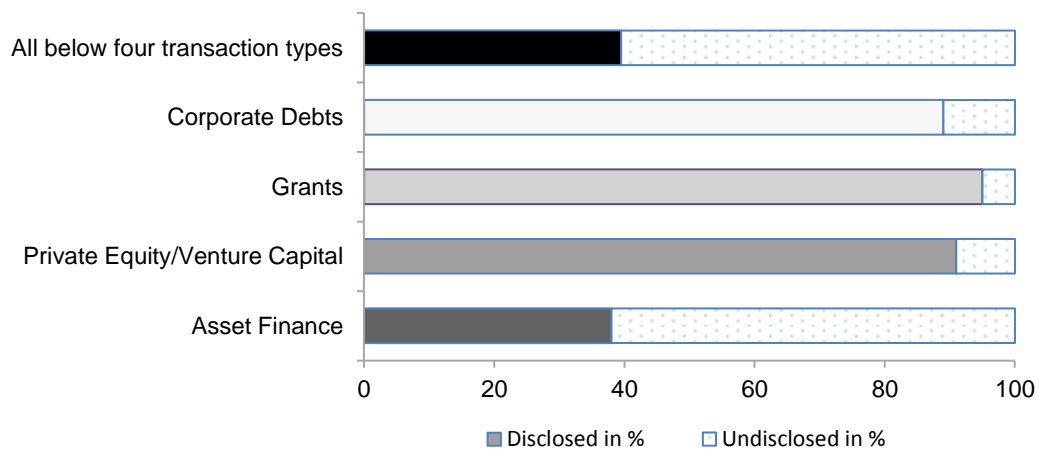
ANNEX 2: THE ISSUE OF UNDISCLOSED TRANSACTIONS

Estimation of financial flows to and in developing countries by types of financial transaction recorded in BNEF for the period 2011-2014 (in USD billion)



Source: Bloomberg New Energy Finance data.

Proportion of transactions reported by BNEF for which a monetary value is available (2011-2014)



Source: Based on Bloomberg New Energy Finance data.

ANNEX 3: CLASSIFICATION OF PUBLIC VERSUS PRIVATE FLOWS

Following DAC directives, transactions (or their fractions) are classified as private or public according to the immediate ownership status of the actor that provided the financing. Flows are considered public if the funds are provided via government entities, state-owned enterprises, academic and research foundations, and public charities which is consistent with the DAC definition of official transactions: “Official transactions are those undertaken by central, state or local government agencies at their own risk and responsibility, regardless of whether these agencies have raised the funds through taxation or through borrowing from the private sector. This includes transactions by public corporations i.e. corporations over which the government secures control by owning more than half of the voting equity securities or otherwise controlling more than half of the equity holders’ voting power; or through special legislation empowering the government to determine corporate policy or to appoint directors.” (OECD DAC, 2013).

Flows are classified as private if not defined as public. More specifically, private flows are usually provided by family-controlled enterprises, quoted companies, joint ventures, consortia, partnerships, special purpose vehicles, individuals/business angel networks, subsidiaries, private equity or venture capital firms, as well as private charities, not-for-profit and associations. This approach is consistent with the approach taken by the recent econometric analysis of mobilisation (Haščič et al., 2015) that was also based on BNEF data.

Classification of finance providers

| Ownership classification | BNEF classification |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Public bilateral | Government / public sector |
| Public multilateral | State-owned commercial entities Academic / research foundations Public charity |
| Private | Individual / angel network, Joint venture / consortium, Partnership (investment, law, etc.), Pre-institutional funding, Private / family-controlled, Quoted company, Special Purpose Vehicle (SPV), Subsidiary / division, VC / PE funded Private charity / non-profit / association |

Source: adapted from Haščič et al., 2015.

Public asset finance transactions marked by BNEF as government/public sector, state-owned commercial entities and academic/research foundation, have been reviewed on a case-by-case basis and, where applicable, classified as multilateral institutions.

ANNEX 4: DEVELOPED AND DEVELOPING COUNTRY CLASSIFICATIONS

The current climate finance reporting under the UNFCCC makes use of Annex II countries (a sub-set of Annex I countries), which have a special obligation to provide financial resources to non-Annex I countries. In the approach based on BNEF data, this study considers countries listed as Annex I as developed, and countries listed as non-Annex I as developing. Although practical to use and reflecting the way countries are currently classified in the context of the UNFCCC, the Annex I/non-Annex I groupings might not, moving forward, provide an accurate picture of flows going to developing countries as it lack systematic and regular updating. Only few new countries have acceded to Annex I over time (Croatia, the Czech Republic, Cyprus¹², Liechtenstein, Malta, Monaco, Slovakia and Slovenia), while countries that are becoming significant providers of aid, such as South Korea, China or Brazil, are still considered as non-Annex I.

Other classifications are available such as the World Bank Atlas method, which classifies all World Bank member economies and all other economies with populations of more than 30,000 according to their gross national income (GNI). For operational and analytical purposes, economies are divided among income groups according to 2013 gross national income (GNI) per capita. The groups are: low income, USD1 045 or less; lower middle income, USD1,046–4,125; upper middle income, USD4,126–12,745; and high income, USD12,746 or more.

OECD DAC and MDBs joint-reporting initiative use their own classification in terms of both developed providers and developing recipients of finance. The MDBs list of recipient countries cover 180 countries where the DAC covers 147 countries. This gap can be notably explained by the fact that MDBs cover European countries where EBRD and EIB conduct projects, whereas they are not eligible to receive development aid as measured by the DAC.

Ultimately, any classification can be used. This will not change the amount of total public and private finance measured, but rather the respective shares that are labelled as developed and developing. It will, however, have a direct impact on the amounts of private finance estimated and reported as mobilised by countries defined as “developed”. Table 3 below presents the list of countries for which the classification into category ‘developing’ differs according to the classification used.

¹² Note by Turkey: The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Differences in country classification (1 = included; 0 = not included)

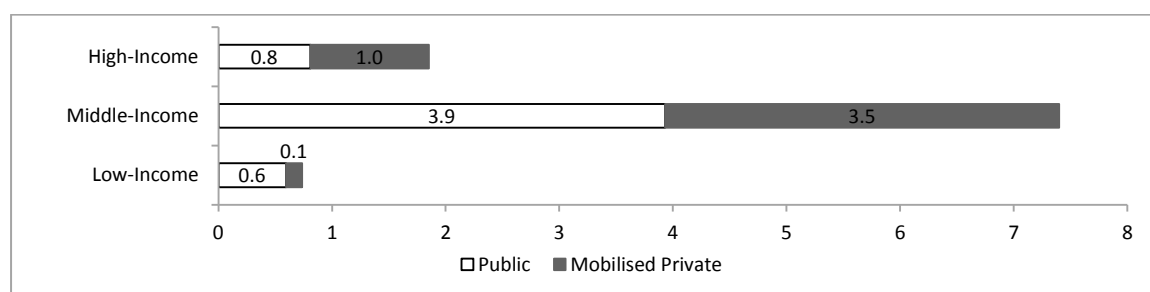
| Countries | Non-Annex I Parties | MDBs Recipients | DAC ODA Recipients | WB classification (low-/middle-income) |
|---------------------------------------|---------------------|-----------------|--------------------|----------------------------------------|
| Andorra | 1 | 0 | 0 | 0 |
| Antigua and Barbuda | 1 | 1 | 1 | 0 |
| Bahamas | 1 | 1 | 0 | 0 |
| Bahrain | 1 | 0 | 0 | 0 |
| Barbados | 1 | 1 | 0 | 0 |
| Belarus | 0 | 0 | 0 | 1 |
| Brunei Darussalam | 1 | 0 | 0 | 0 |
| Bulgaria | 0 | 1 | 0 | 0 |
| Chile | 1 | 1 | 1 | 0 |
| Croatia | 0 | 1 | 0 | 0 |
| Cyprus | 0 | 1 | 0 | 0 |
| Czech Republic | 0 | 1 | 0 | 0 |
| Democratic People's Republic of Korea | 1 | 0 | 0 | 0 |
| Dominica | 1 | 1 | 0 | 1 |
| Dominican Republic | 1 | 1 | 0 | 1 |
| Equatorial Guinea | 1 | 1 | 1 | 0 |
| Estonia | 0 | 1 | 0 | 0 |
| Hungary | 0 | 1 | 0 | 0 |
| Israel | 1 | 1 | 0 | 0 |
| Kosovo | 0 | 0 | 0 | 1 |
| Kuwait | 1 | 0 | 0 | 0 |
| Latvia | 0 | 1 | 0 | 0 |
| Liberia | 1 | 1 | 1 | 0 |
| Lithuania | 0 | 1 | 0 | 0 |
| Malta | 0 | 1 | 0 | 0 |
| Nauru | 1 | 1 | 1 | 0 |
| Oman | 1 | 0 | 0 | 0 |
| Poland | 0 | 1 | 0 | 0 |
| Qatar | 1 | 0 | 0 | 0 |
| Korea | 1 | 0 | 0 | 0 |
| Romania | 0 | 1 | 0 | 0 |
| Russian Federation | 0 | 0 | 0 | 1 |
| Saint Kitts and Nevis | 1 | 1 | 1 | 0 |
| San Marino | 1 | 0 | 0 | 0 |
| Saudi Arabia | 1 | 0 | 0 | 0 |
| Singapore | 1 | 0 | 0 | 0 |
| Slovak Republic | 0 | 1 | 0 | 0 |
| Slovenia | 0 | 1 | 0 | 0 |
| Trinidad and Tobago | 1 | 1 | 0 | 0 |
| Turkey | 0 | 0 | 0 | 1 |
| Ukraine | 0 | 1 | 1 | 1 |
| United Arab Emirates | 1 | 0 | 0 | 0 |
| Uruguay | 1 | 1 | 1 | 0 |
| Uzbekistan | 0 | 0 | 0 | 1 |
| Western Sahara | 0 | 1 | 0 | 0 |

Source: based on joint-MDBs report (2013); DAC, 2014; WB, 2013; UNFCCC, 2015.

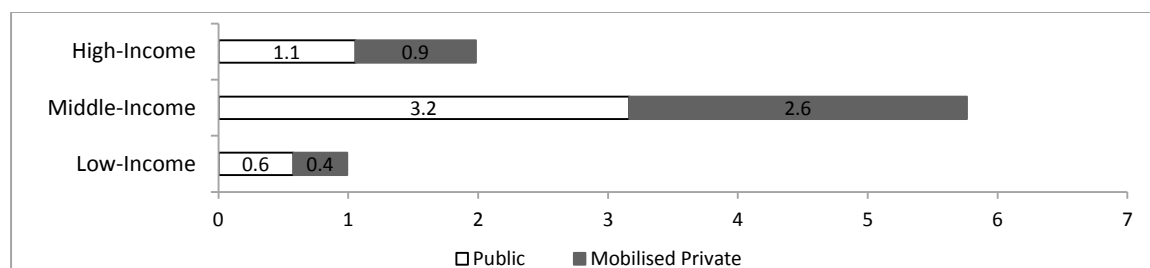
ANNEX 5: MOBILISATION OF PRIVATE FINANCE BY INCOME GROUPS

One possible way to classify countries into developed and developing is to use the World Bank Atlas method, which classifies all World Bank member economies and all other economies with populations of more than 30,000 according to their gross national income (GNI). To analyse where private finance has been mobilised for renewable energy-related activities between 2011 and 2014, countries are aggregated by income groups according to 2013 gross national income (GNI) per capita. The three groups are: low income, USD 1 045 or less; lower-/upper- middle income, USD 1,046–12,745; and high income, USD 12,746 or more. As illustrated by Figure 1, 2 and 3, middle-income economies account for the lion's share of both total public investment (83%) and total mobilised private finance (85%).

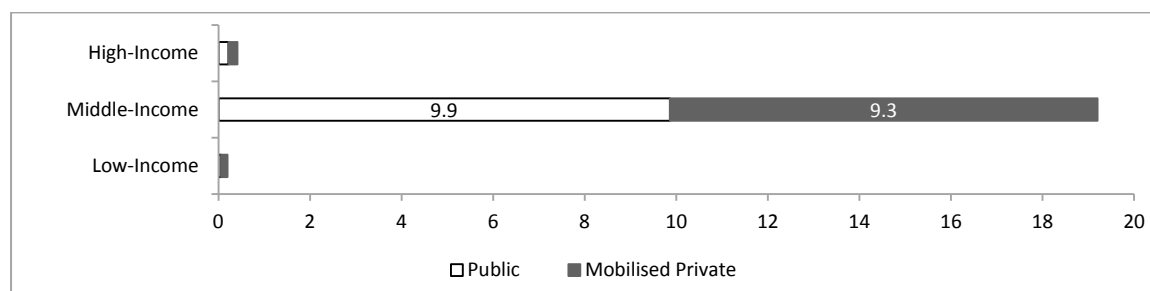
Estimated volumes of renewable energy-related private finance mobilised by multilateral public finance and broken-down by income groups (USD billion for the period 2011-2014)



Estimated volumes of renewable energy-related private finance mobilised by bilateral Annex I public finance and broken-down by income groups (USD billion for the period 2011-2014)



Estimated volumes of renewable energy-related private finance mobilised by bilateral non-Annex I public finance and broken-down by income groups (USD billion for the period 2011-2014)



Source: based on Bloomberg New Energy Finance asset finance data for which transaction values are available.

REFERENCES

- BNEF (2014), *Bloomberg New Energy Finance* (database) www.bnef.com (Accessed February 2015).
- Bolscher, H., E. Veesntra and J. van der Laan (2014), “PILOT – Tracking Mobilised Private Climate Finance”, Triple E Consulting, <http://tripleeconsulting.com/project/pilot-study-tracking-mobilised-private-climate-finance-netherlands>.
- Brown, J., B. Buchner, G. Wagner, and K. Sierra. (2011). Improving the Effectiveness of Climate Finance: A Survey of Leveraging Methodologies, Climate Policy Initiative, <http://climatepolicyinitiative.org/publication/improving-the-effectiveness-of-climate-finance-key-lessons/>.
- Buchner, B., M. Stadelmann, J. Wilkinson, F. Mazza, A. Rosenberg, D. Abramskiehn (2014), “The Global Landscape of Climate Finance 2014”, CPI Reports, Climate Policy Initiative. <http://climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2013>.
- Capperton, R. (2010), Leveraging Private Finance for Clean Energy, Center for American Progress, www.americanprogress.org/issues/2010/11/pdf/gcn_memo.pdf.
- Caruso, R. and J. Ellis (2013), "Comparing Definitions and Methods to Estimate Mobilised Climate Finance", *OECD/IEA Climate Change Expert Group Papers*, No. 2013/02, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5k44wj0s6fq2-en>.
- Caruso, R. and R. Jachnik (2014), "Exploring Potential Data Sources for Estimating Private Climate Finance", *OECD Environment Working Papers*, No. 69, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5jz15qwz4hs1-en>.
- Climate Investment Funds (2014), “Assessing Leverage in the Climate Investment Funds”, World Bank Group; www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/Assessing_leverage_in_the_CIF.pdf.
- Duarte, M., (2014), “Semi-Annual Report on CTF Operations”, Presentation available at: www.climateinvestmentfunds.org/cif/category/cif-documents-document-type/semi-annual-operational-reports?page=1.
- Ellis, J. and C. Regan (2012), Climate Finance: Annotated Questions Document, OECD; Paris, France. www.oecd.org/env/cc/Discussion_Document_Climate_Finance.pdf.
- European Bank for Reconstruction and Development (2013), Joint Report on MDB Climate Finance 2014, www.eib.org/attachments/documents/joint_report_on_mdb_climate_finance_2013.pdf.
- European Bank for Reconstruction and Development (2012), *Sustainable Energy Initiative: Scaling up finance to address climate change*, www.ebrd.com/downloads/research/factsheets/sei.pdf.
- European Development Finance Institutions (2014), European development finance institutions (EDFI) and private sector combat climate change in the developing world. Brussels, Belgium, www.sifem.ch/med/314-edfi-position-paper-climate-finance.pdf.
- FMO (2014), Annual Report 2014. The Hague, Netherlands. <http://annualreport.fmo.nl>.
- Francis William (2015), Bloomberg New Energy Finance, *personal communication*.

- Global Environment Facility (2009), "Investing in renewable energy: the GEF experience", World Bank Group; Washington, United States, www.thegef.org/gef/sites/thegef.org/files/publication/gef_renewenergy_CRA_rev.pdf.
- Guy V (2005), "Sustainable Microentrepreneurship: The Roles of Microfinance, Entrepreneurship and Sustainability in Reducing Poverty in Developing Countries", Global Development Research Center, Kobe, Japan, www.gdrc.org/icm/micro/guy_sust-micro.pdf.
- Haščič, I., et al. (2015), Public interventions and private finance flows: empirical evidence from renewable energy financing, *OECD Environment Working Papers*, No. 80, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5js6b1r9lfd4-en>.
- Illman J., M. Halonen (Gaia Consulting Ltd), S. Whitley and N. Canales Trujillo (Overseas Development Institute) (2014), "Practical Methods for Assessing Private Climate Finance Flows", <http://dx.doi.org/10.6027/TN2014-506>.
- Ingram, G., and J. Biau (2014), "A data picture of USAID public-private partnership: 2001-2014", The Brookings Institution. Washington, United States, www.brookings.edu/~media/Research/Files/Papers/2014/10/10-usaid-public-private-partnerships-ingram/Ingram-PPP-Fact-Sheet-Final.pdf?la=en.
- International Development Finance Club (2014), Mapping of green finance delivered by IDFC members in 2013, www.idfc.org/Downloads/Publications/01_green_finance_mappings/IDFC_Green_Finance_Mapping_Report_2013_11-01-13.pdf.
- International Energy Agency (IEA) (2014), *Medium-Term Renewable Energy Market Report*, IEA, Paris, <http://dx.doi.org/10.1787/renewmar-2014-en>.
- IEA (2013), *Energy Efficiency Market Report 2013 - Market Trends and Medium-Term Prospects*, IEA, Paris, www.iea.org/publications/freepublications/publication/energy-efficiency-market-report-2013.html.
- IEA (2005), *Energy Statistics Manual*, IEA Publishing, www.iea.org/publications/freepublications/publication/statistics_manual.pdf.
- International Finance Corporation (2013), *Leverage in IFC's Climate-Related Investments: A review of 9 Years of Investment Activity (Fiscal Years 2005-2013)*, World Bank Group; Washington, United States, www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/cb_home/publications/publication_leverage_ifc_climate_investments.
- Jachnik, R., R. Caruso and A. Srivastava (2015), "Estimating Mobilised Private Climate Finance: Methodological Approaches, Options and Trade-offs", *OECD Environment Working Papers*, No. 83, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5js4x001rqf8-en>.
- Joint-MDBs (2015), "2014 Joint Report on Multilateral Development Banks' Climate Finance", <http://documents.worldbank.org/curated/en/2015/06/24641149/2014-joint-report-multilateral-development-banks-climate-finance>.
- Joint-MDBs (2014), "Joint report on MDB climate finance 2013", www.eib.org/projects/documents/joint-report-on-mdb-climate-finance-2013.htm.
- Joint-MDBs (2013), "Joint report on MDB climate finance 2012", www.ebrd.com/downloads/sector/sei/climate-finance-2012.pdf.

- Joint-MDBs (2012), “Joint MDB Report on Mitigation Finance 2011”, www.afdb.org/en/news-and-events/article/multilateral-development-banks-join-forces-to-track-climate-financing-10102/.
- Louw Abraham (2015), Bloomberg New Energy Finance, *personal communication*.
- Meier U. and J. Haarstad (2014), Review of Support to the Renewable Energy and Energy Efficiency Partnership, REEEP, Final Report. Norad; Oslo, Norway, www.norad.no/globalassets/import-2162015-80434-am/www.norad.no-ny/filarkiv/vedlegg-til-publikasjoner/review-of-support-to-the-renewable-energy-and-energy-efficiency-partnership-reeep.pdf.
- Netherlands Development Finance Company (FMO), 2014, “FMO Annual Report 2013”, Report of the Supervisory Board. La Haye, Netherlands, <http://annualreport2013.fmo.nl/>.
- Norad (2015), Evaluation of the Norwegian Investment Fund for Developing Countries (Norfund), Report 1/2015. Norad; Oslo, Norway, www.norad.no/globalassets/import-2162015-80434-am/www.norad.no-ny/filarkiv/evalueringsavdelings-filer/evaluation-of-the-norwegian-investment-fund-for-developing-countries-norfund.pdf.
- OECD (2015), Climate finance in 2013-14 and the USD 100 billion goal, a report by the Organisation for Economic Co-operation and Development (OECD) in collaboration with Climate Policy Initiative (CPI), www.oecd.org/environment/cc/OECD-CPI-Climate-Finance-Report.htm.
- OECD (2014), *OECD International Direct Investment Statistics 2014*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/idis-2014-en>.
- OECD DAC (2015), On-going work on measuring the mobilisation effect of public development finance, www.oecd.org/dac/stats/mobilisation-effect-of-public-development-finance.htm.
- OECD-DAC (2014), Statistical flyer on climate-related development finance in 2013, www.oecd.org/dac/stats/climate-change.htm.
- OECD-DAC (2013), Converged statistical reporting directives for the creditor reporting System (CRS) and the annual DAC questionnaire Chapters 1-6, OECD; Paris, France. [www.oecd.org/dac/stats/documentupload/DCD-DAC\(2013\)15-FINAL-ENG.pdf](http://www.oecd.org/dac/stats/documentupload/DCD-DAC(2013)15-FINAL-ENG.pdf).
- OECD-DAC (2011), Handbook on the OECD-DAC Climate markers, OECD; Paris, France. www.oecd.org/dac/stats/48785310.pdf.
- Ölz, S., R. Sims and N. Kirchner (2007), “Contribution of Renewables to Energy Security”, IEA Informal paper, Paris.
- REN21 (2014), *Renewables Global Status Report 2015*, www.ren21.net/status-of-renewables/global-status-report/.
- Ryan, L., N. Selmet, A. Aasrud (2012), *Plugging the Energy Efficiency Gap with Climate Finance: The role of International Financial Institutions (IFIs) and the Green Climate Fund to realise the potential of energy efficiency in developing countries*, www.iea.org/publications/insights/PluggingEnergyEfficiencyGapwithClimateFinance_WEB.pdf.
- Smallridge, D., B. Buchner, C. Trabacchi, M. Netto, J.J. Gomes Lorenzo, L. Seraan. (2012), The Role of National Development Banks in Intermediating International Climate Finance to Scale-up Private Sector Investments, Inter-American Development Bank, <http://publications.iadb.org/handle/11319/5692?locale-attribute=en>.
- Stadelmann M. and A. Michaelowa (2013), *Contribution of the private sector to Climate Change Long-Term-Finance: An assessment of private climate finance mobilized by Switzerland*, University of

Zurich, www.oebu.ch/de/themen/politik/international/bafu-contribution-of-the-private-sector-to-climate-change-long-term-finance.html.

Stumhofer T, Detken A, Harnisch J, Lueg B. 2015. "Proposal of a methodology for tracking publicly mobilized private climate finance." Available from www.kfw-entwicklungsbank.de/PDF/Download-Center/Materialien/Nr.-9_Proposal-of-a-methodology-for-tracking-publicly-mobilized-private-climate-finance.pdf.

Swiss Investment Fund for Emerging Markets (2014), "SIFEM Annual Report 2013", Bern, Switzerland, www.sifem.ch/med/242-sifem-report-2013-en.pdf.

Tanaka, J (2012), Catalyzing private sector climate finance, EBRD presentation the second UNFCCC workshop on long term finance, http://unfccc.int/files/cooperation_support/financial_mechanism/long-term_finance/application/pdf/josue_tanaka,_ebrd.pdf.

United Nation Environment Programme – Frankfurt School (2015), "Global Trends in Renewable Energy Investment Report". <http://fs-unep-centre.org/sites/default/files/attachments/GTREIR.pdf>.

UNFCCC (2015), Ghana's first biennial update report, http://unfccc.int/national_reports/non-annex_i_natcom/reporting_on_climate_change/items/8722.php.

UNFCCC (2010), Conference of the Parties, Copenhagen Accord, <http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf>.

United Nations High-Level Advisory Group on Climate Change Financing (2010), Work Stream 7: Public Interventions to Stimulate Private Investment in Adaptation and Mitigation, www.un.org/wcm/webdav/site/climatechange/shared/Documents/AGF_reports/Work_Stream_7_Public_Private.pdf.