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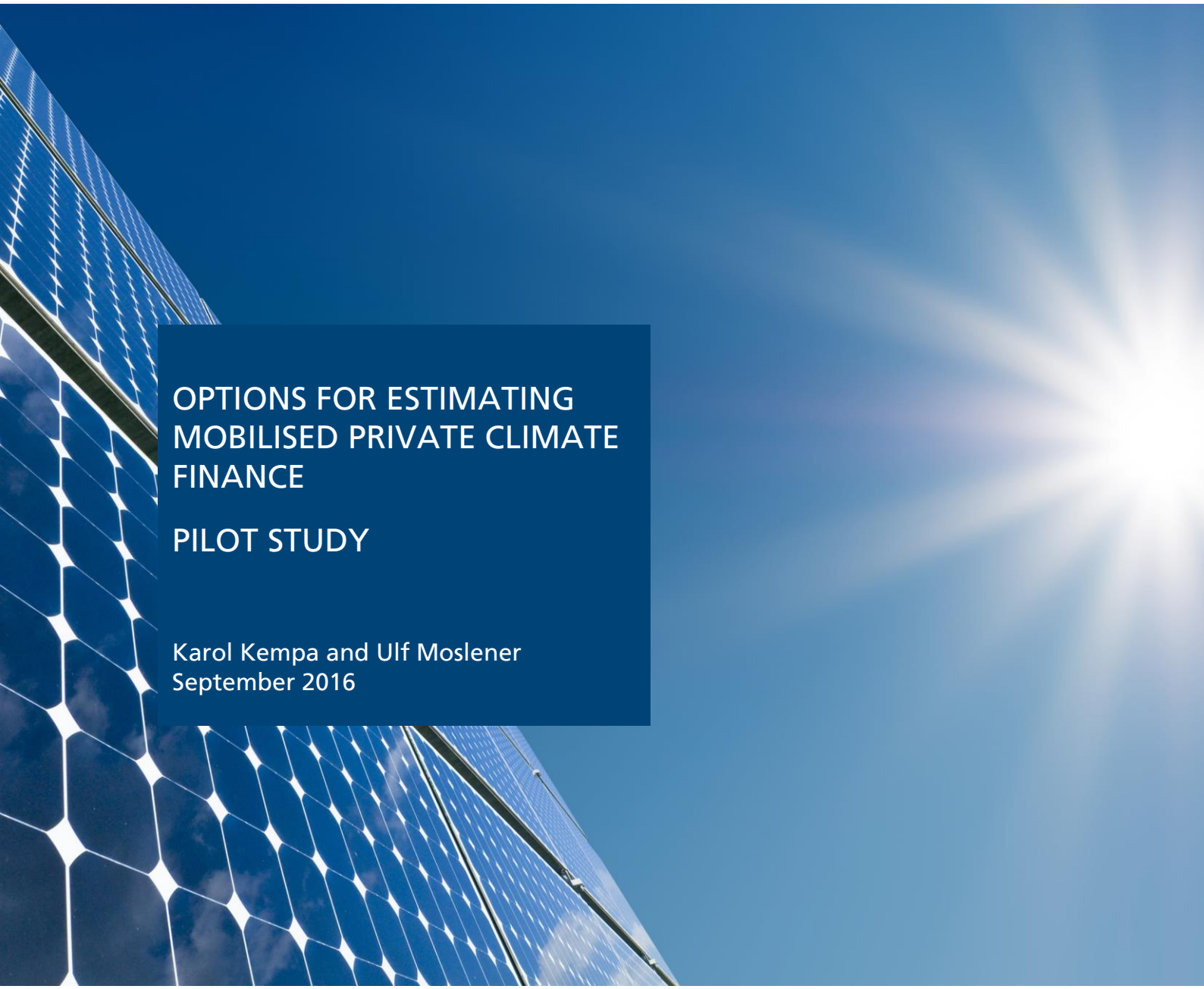

OPTIONS FOR ESTIMATING MOBILISED PRIVATE CLIMATE FINANCE

PILOT STUDY

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1. INTRODUCTION

The OECD-led Research Collaborative on Tracking Private Climate Finance (OECD RC) and a number of governments/ministries involved in it have begun to conduct studies to estimate mobilized private climate finance in the context of the Copenhagen Climate Finance Commitments to mobilize USD 100 billion of climate finance by 2020. Our work is based on the recent syntheses report of the OECD RC "Estimating mobilised private climate finance: methodological approaches, options and trade-offs".

During the preparation of this study, the Technical Working Group (TWG), a group of 19 bilateral climate finance providers, have published a Joint Statement as an input to a study of the OECD, which, in collaboration with the Climate Policy Initiative, estimated progress towards the USD 100 billion commitment (See OECD (2015): Annex F). Various developed countries agreed on a joint methodology to track and report mobilised climate finance. The methodology is based on discussions within the OECD RC and an activity-based methodology that is similar to the Scenarios 1 and 2 presented in this study. The TWG suggests that private finance mobilised by both public finance and public policy should be included. Due to practical reasons, however, in the first available estimations of mobilised private finance only private finance mobilised by public finance is included. This is in line with our considerations in this study, as determining mobilisation by public policy instruments is theoretically and practically very challenging. With respect to attribution of mobilised finance in order to prevent double counting, the TWG agreed on a pro-rata approach. Up to this point, however, there are still some not finally answered open questions.

Based on the current status of the OECD RC's work and the input of the TWG, the aim of this study is to develop different options (Scenarios) for estimating mobilised private climate finance. For some of these Scenarios, first quantifications are presented, i.e. some estimates on mobilisation factors, which are based on broader information and estimations retrieved from the body of related literature. Subsequently, this study discusses and assesses the Scenarios based on the evaluation criteria of the OECD RC. The study aims to allow for an informed discussion on a political and technical level.

2. CHOICE OF SCENARIOS

Based on existing work – particularly as performed and coordinated by the OECD RC – we define a number of Scenarios to quantify mobilised climate finance. We characterise the Scenarios along the dimensions as defined by the OECD RC study (Jachnik, Caruso, and Srivastava, 2015), which ensures that they can be discussed in and related to that context.

Some characteristics are kept constant across the Scenarios. Those are discussed and explained in the following subsection. Thereafter, in subsection 2.2, we define four Scenarios, which are varied with respect to four key characteristics. Pros and cons are discussed – also with respect to the evaluation criteria as proposed by the OECD RC: accuracy, incentives, practicality, and potential for standardisation. The running numbers correspond to those used in Jachnik, Caruso, and Srivastava, (2015).

2.1. CONSTANT CHARACTERISTICS OF ALL SCENARIOS

The following overview shows the methodological options that are kept constant across the Scenarios to estimate mobilised finance proposed and discussed within this study.

Table 1: Constant methodologies across Scenarios

No	Question	Suggested Choice of Option & Comment
D1	Which sectors, activities and projects count as LCR-specific	**Option 1:** Refer to existing working definitions e.g. OECD DAC Rio Markers, joint-MDB reporting positive list *Comment*: Due to practicability, currently available data and definitions should be used (particularly in the short-run). A weakness could be inconsistent data (definitions might not be completely equal across sources).
D3	Which criteria for categorising actors as public or private	**Option 4:** Define a pre-agreed set of actors considered public or private. e.g. commercial bank, household as private; development finance institution, aid agency as public *Comment*: The definition of actors as private and public allows a sufficient accuracy with simultaneous practicability. Example of grey area: public pension funds that behave like private actors. The option has high potential for standardisation.
D4	Which public finance is included as mobilising private finance	**Option 1:** All climate finance provided by public entities (as defined under D3) *Comment*: This should be the "underlying set" of financing that serves as a basis to estimate "mobilised private climate finance".
D5	How to handle actors with both public and private capitalisation or origin of funds	**Option 3:** No apportioning - 100% of the finance provided by the entity recorded as public or private (based on principles under D3) *Comment*: This Option is chosen, since it is based on the principles of the Option chosen in D3.
D6	How to classify countries as developed or developing	**Option 1:** Use existing UNFCCC Annex I, non-Annex I, Annex II **Option 2:** Use other existing definitions e.g. OECD DAC members and ODA recipients, MDB, etc. *Comment*: Based on the principle as in D1 to rely on existing definitions, particularly in the short-run.

D7	How to assign finance to a country of origin	**Option 1:** Based on the headquarter location of the immediate entity financing a specific transaction, asset, or project *Comment*: This option focuses on the actual source of finance and hence seems to be suited best from a practicality perspective.
D8	How to handle multiple country ownership/funding	**Option 1:** Pro-rate based on nationality of individual equity ownership/percentage of total finance provided *Comment*: This option apportions mobilised finance on a pro-rata base. This Option is more precise and accurate than the alternatives, while it is still practicable. However, in the Scenarios we differentiate between an "actual" pro-rata approach based on face values and an approach where apportioning is based on the present value / grant equivalent of public contributions.

In addition to the methodological options as selected above, there are a number of rather technical characteristics for defining and measuring mobilised private finance that are kept constant across the Scenarios.

Table 2 Constant characteristics of measurement / valuation of private finance across Scenarios

No	Question	Suggested Choice of Option & Comment
A1	What reporting currency to use	**Option 1**: Use international currency e.g. USD (per the USD 100 billion commitment), EUR *Comment*: Using an international currency, as EUR or USD, allows for the best comparability as well as aggregation of climate finance flows.
A2	What exchange rates to use	**Option 1**: Convert based on rate at project commitment *Comment*: Using the exchange rate at project commitment is more accurate than choosing a yearly average. The timing (at commitment) is based on the chosen Option in A4 (see below).
A3	How to calculate the value of local vs. international currency	**Option 1**: Do not make any distinction *Comment*: Any further "adjustments" via the exchange rate seems conceptually controversial and too easy to justify. There seems to be no substantial value-added
A4	Which point of measurement and reporting to use	**Option 1**: Point of commitment of the finance *Comment*: Under "point of commitment", we understand the point in time when the financing contract is signed (the signature of the contract in case of financial cooperation and "financial close" in case of private investment). This does not include informal commitments of. The major advantage is data availability, as disbursement data, e.g., is not widely available. Furthermore, each financing flow has only one point of measurement (in case of measuring at the "point of disbursement", several points of measurement are possible, if financing is not paid at once). Finally, this method is close to the financing decision, widely used by bi- and multilateral development banks. This definition also includes the commitment of pledges.

Some of the characteristics as predefined by the OECD RC (e.g., A5, A7, A8 and A9) are determined later in context with the respective concrete Scenario. This holds in particular for the assumptions with respect to causality. Furthermore, options (A6, A10, and A11) depend directly on the choice of methodological options and are likewise made explicit later.

Finally, there are a small number of criteria left about which assumptions are needed and which are at the same time less straightforward. Those are shown in the table to follow in combination with a suggested assumption based on a short discussion of the options.

Table 3 Overview of characteristics to be discussed

No	Question	Suggested Choice of Option & Comment
D2	Should only part of given activities and projects count as LCR-specific	**Option 2**: Gradation e.g. using the Rio markers methodology **Option 4**: Count 100% of project with any LCR-specific components Option 4 would be more practicable. However, Option 2 is more accurate, since it differentiates among projects based on the climate components. At the same time, Option 2 remains feasible and is hence the preferred Option
D9	Which private finance (geographical origin) can count as being mobilised	**Option 2**: All private finance originating from developed countries **Option 4**: All international and domestic private finance to and in the destination (developing) country Option 2 only includes mobilised private finance originating from industrial countries (North-South approach). Option 4 considers all private finance independent of its origin. Hence, Option 4 focusses on the actual investments that are induced by public actions. Furthermore, Options 2 is more difficult to work with if political interventions, e.g. FiTs, are considered. If a (co-) financed FiT in a developed country led to local investments financed only from local sources, the mobilised private finance of this FIT would be equal to zero. Furthermore, there might be an issue to accurately and practically determine the geographical origin of private finance Hence, in most of the suggested Scenarios, Option 4 is chosen. However, at least one Option considering only private finance from developed countries is included as well.

2.2. THE PROPOSED SCENARIOS IN DETAIL

One major issue still to be determined for the definition of the Scenarios is "causality": Is there a causal relationship between public interventions and private investment? Even if a causal relationship can be identified, a related issue may be the question: By whom (which country) is the investment mobilised? The latter one is particularly important if mobilised private finance needs to be attached to individual countries as opposed to, e.g., joint reporting by all Annex-I-countries.

In the following, we therefore suggest Scenarios to quantify mobilised private climate finance. The Scenarios vary mainly with respect to assumptions about causality, but, as it is shown below, more assumptions are needed that might have an impact on the volume as measured.

Two of the four core Scenarios follow a bottom-up approach (Scenarios 1 and 2), where the calculation is based on transaction-level data (e.g. loans to a project). The other two (Scenarios 3 and 4) follow a top-down approach where, out of aggregate numbers (e.g. total public finance provided by a certain industrial country), "mobilised" finance be estimated or approximated.

Before we suggest the Scenarios, we introduce a theoretical project example which might be helpful in order to illustrate particularly the bottom-up Scenarios. We look at a renewable energy project in a developing country. The following shows all potential sources of public and private debt and equity finance as well as other support targeted at the project including public policy interventions. The variables denote the so-called "face value" of the respective monetary value (e.g. the face value of a private loan provided for the project). If the present value (PV) is used then this is made explicit in the calculations (i.e. PV(…)).

- I: total project investment (specific project)
- $E_{priv,local}$: equity from the (developing) country itself
- $E_{priv,1}$: equity from industrialised country 1
- $E_{priv,2}$: equity from industrialised country 2
- $D_{DFI,1}$: public finance debt from an industrialised country 1

- $D_{DFI,2}$: public finance debt from an industrialised country 2
- $D_{DFI,local}$: public finance debt from a local public finance institution (PFI)
- $D_{priv,local}$: commercial debt from a local bank
- $D_{priv,1}$: commercial debt from a bank in an industrialised country 1
- FiT_{local}: feed-in tariff of the local government
- $FiT_{topup,1}$: feed-in tariff to-up paid by an industrialised country 1
- $TA_{FiT,1}$: technical assistance (TA) , e.g. to establish the feed-in-tariff by industrialised country 1
- $TA_{I,2}$: TA for the project
- $PV(.)$: Present value of the cash flow of an instrument.

We now present the four Scenarios, illustrate them at hand of the example and provide some initial discussion.

2.2.1. SCENARIO 1: BOTTOM-UP APPROACH FOR PUBLIC FINANCE

This Scenario represents a bottom-up approach focussing on public finance and looking at the private contribution in a co-financing arrangement. It does not account for any (project related) TA or other policy interventions such as a feed-in-top-up.[1]

The Scenario assumes that the mobilised investment, I_{mobil}, is given by the total project investment minus all debt and equity contributions from public sources. In other words, this Scenario assumes the full amount of all private climate finance, irrespective of its origin (industrial country or developing country), as mobilised by public co-finance for the project.

If the public funding originates from just one country, then the full mobilised private finance is attributed to that country. If there is more than one country engaged with public funds (as in the example above), then mobilised investment is weighted based on the relative value of each public finance contribution. Such value could be estimated in different ways, e.g. based on face value (1B), present value, or the grant element of the public finance contribution (1A). Here the OECD DAC concept of the "Risk-adjusted grant equivalent" for loans, equity and guarantees, which has now been formally approved by DAC members, could be a practical option (OECD, 2016).

In our illustrative example, mobilised financing, I_{mobil}, is given by

$$I_{mobil} = I - D_{DFI,1} - D_{DFI,2} - D_{DFI,local},$$

where the part of mobilised finance that is attributed to country 1 is given by

$$I_{mobil,1} = \frac{PV(D_{DFI,1})}{PV(D_{DFI,1}) + PV(D_{DFI,2})} * I_{mobil},$$

and country 2 likewise

$$I_{mobil,2} = \frac{PV(D_{DFI,2})}{PV(D_{DFI,1}) + PV(D_{DFI,2})} * I_{mobil}.$$

For Scenario (1B) the face value contributions are used instead of the present values.

[1] Following Jachnik, Caruso, and Srivastava, (2015), we define public finance (interventions) as those in which a public entity provides direct financial support, while public policy interventions provide indirect support to receiving countries' activities and to shape their markets through, e.g., TA or FiT (top-ups), etc.

Preliminary reflections on this Scenario:

- Data requirements for this Scenario are substantial (even more so if present values are used) as information needs to be available on the project level (e.g. grant equivalents according to the new OECD DAC method at the loan level for all concessional loans involved in a project financing transaction).
- A possible advantage of this approach may be the simplicity regarding the calculation given the data is available. The simplicity/practicality is even more pronounced in Scenario 1B, where face value of the loans is used instead of present value. The difference between 1A and 1B is driven to a large extent by (a) the volume of projects where more than one provider of concessional finance is involved and (b) the difference in concessionality. If concessionality is similar then attribution based on face value tends to generate very similar results.
- A substantial drawback might be seen in the fact that the Scenario does not incorporate any technical assistance and likewise no public interventions, which are not concessional finance such as a feed-in-tariff top-up supported by some industrialised country.

2.2.2. SCENARIO 2: BOTTOM-UP APPROACH FOR PUBLIC FINANCE & INTERVENTIONS

Like Scenario 1, this represents a bottom-up approach. However, Scenario 2 includes public finance interventions as well as other public policy interventions such as TA etc. Like in Scenario 1, this Scenario includes private finance form all countries.

Mobilised finance in Scenario 2 is therefore (as before) given by:

$$I_{mobil} = I - D_{DFI,1} - D_{DFI,2} - D_{DFI,local}$$

The major difference as compared to Scenario 1 lies in the attribution: Here, mobilised financing is attributed based on not only public financing contributions but also considering the role played by technical assistance and other support mechanisms such as a top-up on a feed-in-tariff provided from international public finance sources. Like in Scenario 1A, the present value (or the grant element) of all interventions is used to attribute the mobilised finance to the different industrialised countries. Again methodologies and key variables such as reference interest rates may be used based on OECD DAC standards. For specific instruments, such as a feed-in-top-up, the present value might need to be estimated based on a number of key variables.

The sum of the present values (subsidy elements) of all public interventions turns can be determined in the following way:

$$PV(PF) = PV\left(D_{DFI,1}\right) + PV\left(D_{DFI,2}\right) + PV\left(D_{DFI,local}\right) + PV(FiT_{local}) + PV\left(FiT_{topup,1}\right) + TA_{I,2}$$

The part of the mobilised (private) finance mobilised by (industrialised) country 1, $I_{mobil,1}$, is therefore:

$$I_{mobil,1} = \frac{PV\left(D_{DFI,1}\right) + PV\left(FiT_{topup,1}\right)}{PV(PF)} * I_{mobil},$$

with country 2:

$$I_{mobil,2} = \frac{PV\left(D_{DFI,2}\right) + TA_{I,2}}{PV(PF)} * I_{mobil}.$$

While the feed-in-top-up that is actually paid for a project is considered in the attribution of the private finance,, this is not the case of political interventions, which are not project specific, like a TA to assist a country in introducing a local feed-in-tariff. In a bottom-up framework, this would be conceptually challenging with regards to the actual causality. If in the example above the feed-in top-up by country 1 would be the only public intervention in the project, then – even in case of a small top-up – the whole

investment benefitting from that top-up would be counted as mobilised by country 1.[2] This problem would appear more tractable for the class of top-down approaches.

Preliminary reflections on this Scenario:

- Main approach here is trying to make different public interventions (public finance as well as feed-in top-ups and technical assistance) comparable by identifying the subsidy component or the present value.
- As opposed to Scenario 1, policy interventions are considered.
- Using the new OECD DAC method for defining risk adjusted grant elements implies, in case of more than one industrial country providing public finance, that higher subsidies by a country (lower interest rate or longer tenor etc.) increases the amount of private finance that can be attributed as mobilised by this country.
- Calculating the Scenario might be more complicated, especially when it comes to the policy interventions. (E.g.: What is the present value of a FiT top-up from a project perspective?)
- Furthermore, one needs to distinguish between project related and more general TA.

2.2.3. SCENARIO 3: TOP-DOWN APPROACH – MOBILISATION FACTORS

Scenarios 3 and 4 follow a so-called top-down approach. Here the calculation is not based on the project level, but based on aggregate data combined with the use of somehow standardised multipliers or "mobilising factors". One could argue, however, that these Scenarios are not entirely top-down approaches, because, as it is shown below, one approach to determine these multipliers is based on project level data.

Overall, these approaches are not perfectly accurate and cannot reflect every detail, but by nature include some degree of estimation. The reduced accuracy is expected to come with a higher degree of simplicity, practicality, transparency. Once those factors are determined, it is relatively straight forward to calculate/estimate mobilised private finance using the factors. Another advantage compared to Scenarios 1 and 2 is the potentially stronger notion of causality, as causality is a central aspect in the methodology for deriving these mobilisation factors.

The determination of those mobilising factors is indeed the challenging part of such an approach. They may, in principle, be determined in many ways. The different ways can be expected to have individual strengths and weaknesses and a one-size-fits-all clearly dominating methodology is unlikely to exist. Any mobilising factor is roughly characterised by three questions: (i) what is the base that the factor is multiplied with? (e.g. public climate finance) (ii) What is the level of aggregation on which the factor(s) is (are) determined? (e.g. country specific factors, instrument specific factors, etc.) (iii) How and how often is the factor determined? (e.g. based on a standardised econometric study, similar to the study of Haščič, et al. (2015), performed on a bi-annual basis)

In general, there may also just be a standardised way to suggest an initial set of factors, which then simply forms an input to a political negotiation about the values that will be used.

In our Scenario 3, we assume that a mobilising factor is based on public interventions (public finance and policy interventions) and reflect how much private finance is mobilised on average by a given volume (portfolio) of public interventions. There are many ways to determine such a factor and those ways may be combined.

One option would be to take a subset of (representative) projects and determine a factor based on this project sample. The calculations might look very similar to what needs to be done for the bottom-up

[2] Consider the extreme case, where country 1 provides a marginal top-up on the FiT in the developing country and no other country provides any public finance or public policy intervention. In this example, all private investments that benefit from the FiT incl. the top-up would be attributed to country 1, while it is rather problematic to assume that there is a causal relationship between the small top-up and all private renewable energy investments subject to the FiT.

Scenarios 1 and 2, but they would not need to be performed for the whole portfolio in detail, but just for a sub-portfolio. Based on this, one would estimate a standard factor. Such a micro-founded approach is the more accurate the better the project sample represents the portfolio to which the factor is applied in the end.

Another option would be to estimate a standard mobilising factor based on statistical or econometric analyses that are looking at the effect of different public finance flows and policy interventions on private investment in developing countries. This was well illustrated by Haščič I et al. (2015).

In a case, where just one mobilising factor is to be determined (i.e. neither target country, nor donor country, but for illustrative purposes instrument specific) the mobilised private investment would be:

$$I_{mobil,1} = PV(D_{DFI,1}) * mfactor1 + PV(FiT_{topup,1}) * mfactor2 + PV(TA_{FiT,1}) * mfactor3.$$

To achieve a higher degree of accuracy, one could further differentiate the factors according to target or donor country. In other words: whenever it is possible to distinguish different „classes" of mobilising interventions where within such a class the mobilising mechanism (i.e. causality) is similar, one could think of determining a mobilising factor for this „class". This allows to trade-off flexibility and potential accuracy against ease of data availability and simplicity.

Preliminary reflections on this Scenario:

- A substantial advantage of this Scenario is that public financing as well as policy interventions can be considered in the calculation/estimation.
- Based on the sample and the methodology to determine the mobilising factors, e.g., also using econometric techniques wherever possible based on data availability, this approach might incorporate aspects of actual causality. (This is less pronounced in the bottom up approaches above.)
- Weighting could be problematic and also relates to the selection of a sample that can be used to estimate a mobilising factor. As in other cases, we face the trade-off between precision and practicality.
- In this context, it can be expected that not all project types have sufficiently detailed data to generate reliable econometric work. For renewables we expect sufficient data to be available – particularly for wind and sun (e.g. the BNEF database).

2.2.4. SCENARIO 4: TOP-DOWN APPROACH – DISCOUNT FACTORS

Scenario 4 is conceptually very similar to Scenario 3. We simply change the base for the estimation of mobilised finance. The general idea would be not to start from the public finance in order to estimate private mobilised finance but to start from private (co-)finance. In this Scenario, we take private co-financing in projects which contain public finance as the base for quantification. As a consequence, a discount factor is applied in order to reflect that only part of the (total) private (co-)financing was mobilised by country 1. This is conceptually the main difference to Scenario 1, where all co-financing is assumed to be mobilised, while in Scenario 4, the discount factor is supposed to measure the share of private co-finance that is caused by public finance. Hence in this Scenario, similar to Scenario 3, causality is a central aspect.

In a simple case, the attributable mobilised private investment would be calculated by taking the total private co-financing (of all projects where at least some public funding or some industrialised country is involved in the financing) and multiplying that with a discount factor:

$$I_{mobil,1} = (E_{priv,local} + D_{priv,local} + D_{priv,1}) * discountfactor.$$

As in Scenario 3, it is in general possible to define target- or donor specific factors.

Preliminary reflections on this Scenario:

- An advantage of this Scenario can be the simple calculation once there is a determined/agreed discount factor. Given this discount factor, private co-financing can be translated into actually mobilised private finance.
- Such a discount factor, that could be determined with similar methodologies as the mobilisation factor suggested in Scenario 3, would incorporate some aspects of causality as it aims at transforming all private co-financing into mobilised private finance.
- Obviously, using such a discount factor – based on co-financed projects – does not a priori incorporate public interventions. This is a disadvantage of this method compared to Scenario 3.

3. QUANTIFICATION OF SCENARIOS

This section presents approaches to quantify mobilised private climate finance for each Scenario, as well as first estimations of mobilisation- and discount factors are performed based on available data and studies. As in many cases a measurement as proposed by the conceptual designs of the Scenarios is not possible, e.g. due to missing data (in the short- and/or medium run), alternative approaches using proxies are considered. The final subsection provides an overview of preliminary results of the quantifications of mobilised private finance based on the different Scenarios (wherever possible).

Note that data availability limits as well as conceptual challenges with each of the approaches are severe. The purpose of this paper is to enable an informed discussion rather than suggesting a dominant approach or being accurate in the quantification. The data that are used for this study are not chosen by scientific standards in the sense that our emphasis was not on "official" and/or verified data and accuracy but rather on whether early and sometimes informal statistics exist and what could be achieved with that information. The efforts to quantify need to be interpreted in that light.

3.1. SCENARIO 1: BOTTOM-UP APPROACH FOR PUBLIC FINANCE & INTERVENTIONS

The quantification of mobilised private finance according to Scenario 1 has varying data requirements based on the suggested versions A and B. The two sub-scenarios differ in their approach of how mobilised private climate finance is attributed to donors if more than one sponsor provides public finance for the same project. Total mobilised private finance is calculated the same in sub-scenarios A and B: it is defined as all private contributions to the investment. If only one country is providing public finance to a project, all private finance is attributed to the respective country. Two alternative approaches for attributing mobilised private finance in case of investments with more than one donor are described below: the "face value" and the "present value / grant equivalent" approach.

3.1.1. SCENARIO 1B: FACE VALUE

For all projects, where sponsors other than Germany provide public funds, the mobilised private finance, calculated as described above, is attributed based on a pro rata approach, i.e., based on the face value of the respective public finance contribution. This approach is similar to the one suggested by the DFIs (Joint-DFIs' Approach) and hence not outlined in detail (see Stumhofer, Detken, Harnisch, and Lueg, 2015).

3.1.2. SCENARIO 1A: PRESENT VALUE / GRANT EQUIVALENT

Here, in projects where more than one donor of public finance is involved, mobilised private finance, calculated as described above, is attributed based on a present value approach. A suitable approach seems to be the Risk-Adjusted Grant Equivalent Approach as proposed in OECD (2016).

In order to attribute private finance based on the PV of public finance, the Grant Equivalent of all contributions of Germany and all other donors' public financing would have to be calculated. Hence, detailed information in the conditions of all public finance contributions in projects with German participation would be needed (loan interest, maturity, grace period, etc.). In case such detailed data, particularly for other donors' public financing, is not available, it might be possible to use Scenario 1B as a proxy (at least in the short- order medium-run). In order to assess whether Scenario 1B and 1A deliver strongly different results, the following questions should be checked:

i. In how many projects / which share of the German climate portfolio are other donors than Germany involved in co-financing?
ii. In the cases where other countries are involved, are the financing conditions of participating donors in projects typically similar? Or does Germany provide (on average) systematically more or less favourable conditions (higher or lower Grant Equivalent)?

The larger the share of projects where Germany is the sole public finance provider in the total portfolio, the smaller is the impact of the attribution of mobilised finance in co-funded projects and, hence, the more similar would be the results calculated based on Scenarios A and B. The same is true if the financing conditions of public finance of different donors in co-financed projects are typically similar. In that case, the sub-scenarios should yield relatively similar results. If conditions typically differ, the information whether the Grant Equivalent of German public finance is on average higher or lower than the Grant Equivalent of other donors' public finance (in jointly co-funded projects) would give an indication on the direction of a measurement bias using Scenario B as a proxy. If German public finance has on average a higher (lower) Grant Equivalent, then a face value-based pro-rata attribution systematically underestimates (overestimates) mobilisation relative to mobilised finance attributed to other donors. In general, the higher the share of projects where Germany is the sole public finance provider, the smaller are the biases induced through different financing conditions of German compared to other countries' public finance.

Another potential difficulty in quantification is equity. The on-going DAC reform of ODA has approved the grant equivalence principle for equity and guarantees as well (in addition to loans), while specific calculation methods are, however, still under development OECD (2016). In current OECD DAC statistics, equity is only partly covered and the methodology of capturing the data has unfavourable incentive implications. In the short- and medium run, it might be an option to assess the significance of equity financing in the German climate finance portfolio and, in case it plays a minor role, abstract from public equity finance.

According to consultations with KfW, a rough estimate concerning co-financed projects (where other public finance institutions are involved in financing alongside with KfW) is that a significant share of all projects is co-financed (perhaps on the order of 40 to 50%). This high share, however, is not necessarily problematic since the loan conditions seem, on average, to be not significantly different between KfW and other participating DFI's. There seems to be a slight tendency for higher grant elements for KfW loans. But it would need to be determined to what extent this systematically differs within a project. Hence, the methodology of Scenario 1B might not yield strongly different results if compared to Scenario 1A. If the results differ, it should be expected that, results of quantifying mobilised finance according to 1B yield slightly lower numbers for mobilisation for Germany, since a potentially slightly higher grant element in German public financing would favour the attribution of mobilised private finance in Scenario 1A that relies on grant elements.

A detailed quantification of Scenario 1A would require a lot of information at the project level. Discussions suggest that this might be generally possible. But on top of the significant effort that would be needed, there are legal restrictions with respect to data protection to be overcome (e.g. bank secrecy).

3.2. SCENARIO 2: BOTTOM-UP APPROACH FOR PUBLIC FINANCE & INTERVENTIONS

The basic approach for estimating mobilised climate finance builds largely on Scenario 1A. The main addition is that policy interventions are also to be included. In this Scenario, however, it is difficult to use a face value approach as a proxy for public finance, as suggested above, because loans would then have a way to large weight compared to, e.g., technical assistance.[3] The required data would include detailed conditions on public financing of Germany and other donors in order to calculate the respective grant equivalents. Furthermore, information in TA as well as the PV of other policy interventions, as FiT top-ups, would be required at the project level.

Stumhofer, Detken, Harnisch, and Lueg (2015) and consultations with KfW indicate that, to a large extent, those data might in theory be available from many DFIs, but again banks may be legally restricted to share the data. Hence, the estimation under this Scenario could work with the use of a formula to be applied by an institution that might have the required data. Particularly the estimation of the PV of policy intervention, as a FiT top-up, is very difficult on the project level. A theoretically possible approach would be to conduct a cash flow model of projects supported by FiT in order to calculate the portion of the cash flow that is due to the top-up on the FiT. In a second step, the PV of these cash flow top-ups would have to be calculated.

With respect to the short- and medium run perspective, it seems appropriate to check the relevance of these policy interventions in German climate policy/finance. If FiT top-ups play a largely subordinate role, it might be an option to disregard such policy instruments in the short- and medium run. Similarly, it is difficult to assess the PV of TA that is not project specific. If TA is specific to a project, it can be compared with the grant equivalent of public financing for this project and both values can be used jointly in calculating mobilised private financing. If TA is more general, e.g. for a developing country's ministry in order to provide support for an energy policy reform, it is almost impossible to assess what private investments resulting from this policy reform can be actually attributed to the TA and hence counted as mobilised private finance. Based on these considerations, one might discuss to what extent an exemplary approach to quantify the mobilised finance (facing challenges as mentioned above) would be practically feasible. Independently, one might discuss to what extent it will be helpful to track project specific data as they would be needed for future projects.

3.3. SCENARIO 3: TOP-DOWN APPROACH – MOBILISATION FACTORS

According to this Scenario, mobilised private climate finance is measured based on mobilisation factors. The main idea is to derive these mobilisation factors – which might be specific to different instruments – from existing data/projects/studies. The following presents mobilisation factors for public finance as well as TA derived from the OECD RC Study, data on leverage ratios of public finance for climate-related projects as well as experimental studies in development. These mobilisation factors could be used to estimate mobilised private climate finance based on data on German public climate finance. Note that the different sources discussed below yield different proxies for mobilisation factors. If private climate finance mobilised by Germany was to be estimated based on these proxies, one would have to decide whether all should be used in order to estimate a range for the estimate of mobilised private finance or, e.g., a (weighted) average of these proxies should be used to generate one average proxy for a mobilisation factor. An overview of all derived mobilisation factors is provided in Table 4 at the end of this subsection.

[3] Essentially, this is similar to the difference between 1A and 1B: the subsidy element in a technical assistance measure would be 100% - substantially different from, e.g., concessional financing.

i. Insights from an econometrics-based OECD study

A possible approach for determining the mobilisation factors is using quantitative methods, i.e. econometric analyses as suggested and trialled by the OECD (Haščič et al., 2015). The most immediate approach would be to use the estimated "mobilisation factors" of this empirical study to estimate mobilised private climate finance of Germany.

In their econometric analysis, Haščič et al. (2015) cover six renewable energy sectors for 769 country pairs for the period 2000-2011. The study focuses on renewable energy generation, because the data availability for these sectors (BNEF database) is best, as also discussed in the OECD RC synthesis report (Jachnik et al., 2015).

A short-term methodology could be to take the marginal effects of public finance and policy interventions from the study in order to calculate mobilisation of Germany. Main results are that the provision of bilateral public finance has a significant positive effect on private finance. The same is true for the effect of multilateral finance, though of relatively lower size.

The marginal effect of bilateral public finance on private finance is estimated to be **0.3597**. This means that one USD of public finance (measured at the face value) leads to USD 0.36 of private finance. The mobilisation factor of multilateral public finance flows is estimated at 0.0952.

This approach, however, has several underlying assumptions:

i. public finance from Germany does not systematically differ from all other industrial countries - Haščič et al. (2015) estimate the effects based on data on all developed countries,

ii. marginal effects that are only estimated for renewable energies are similar to mobilisation effects for all other relevant sectors, and

iii. the quantitative effects, estimated on historical data, did not change significantly over time.

The analysis of Haščič et al. (2015) focuses on public finance flows, namely equity and debt. The underlying data does not allow for an analysis of grants due to missing data. However, the authors include ODA data (includes grants) as explanatory variable. The estimations show that grants do not significantly affect private financing for renewable energy projects. It could be argued, however, that this study's sole focus on public equity and debt might be problematic. However, this focus seems be a rather minor issue according to the financing mapping of the IDFC (2014), which shows the dominance of concessional and non-concessional loans in the climate finance activities of national development banks (in 2013): for the financing flows that could be attributed to specific instruments (around 70%), 78% of financing was provided via concessional loans, 17% by non-concessional loans, and only 3% by grants. However, CPI (2015) reports that grants amount to USD 14 billion indicating that they are not neglectable when estimating mobilised private climate finance.

Furthermore, the sole focus on renewable energy generation is a weakness. According to the IDFC (2014), while more than 70% of green finance commitments in 2013 (USD 72 billion) are dedicated to green energy and mitigation of greenhouse gas emissions, only 36% of these commitments relate to, renewable energy. Energy efficiency in industry and buildings, e.g., also plays a significant role with 33% of all commitments dedicated to green energy. A similar picture can be seen in the climate- and environment-related commitments of KfW Development Bank in 2014, where 41% of total commitments of EUR 4.7 billion are dedicated to renewable energy, whereas 29% are dedicated to energy efficiency (KfW, 2014).

Hence, the mobilisation factors derived by Haščič et al. (2015), the so far most in comprehensive empirical study related to mobilisation of private climate finance, could be used as a starting point for deriving mobilisation factors for Germany's public interventions in the field of renewable energy, but should be supplemented by quantitative estimates from other studies or initiatives. Another approach would be to

conduct a study similar to Haščič et al. (2015) and extend it by explicitly differentiating between developed countries in order to derive estimates for German public finance instead of an average of all donor countries.

ii. Historical flows and leverage factors as sources for mobilisation factors

In all of the potential methods presented below, the underlying causality is not considered explicitly as the observed private climate finance is not compared to a (hypothetical) business as usual scenario. Hence, it is important to consider that the leverage factors derived below are actually not mobilisation factors in the sense of this Scenario. More precisely, they may, on average, overestimate mobilised private finance as they count all leveraged private finance irrespective of whether private finance would have been provided in the business as usual case (without public intervention). As they can be helpful for a first step of quantification in the short run, they are presented as a potential (very rough) proxy for mobilisation factors.

Aggregated data on climate finance flows

A potential source for an estimate of mobilisation of German public finance is "The Landscape of Climate Finance in Germany" of CPI (Jürgens et al. 2012). Based on the approach of counting all financing originating from public intermediaries, as e.g. public banks, as public finance, the report shows that in 2010 EUR 16.5 billion were provided by public banks through concessional loans whereas private intermediaries, as private banks or institutional investors, provided EUR 12.4 billion. Using this information is, however, somewhat problematic. The data shows aggregate flows in Germany, hence it is not possible to judge whether (and to which extend) public finance has actually mobilised the observed private finance flows. In addition, this analysis focuses on investments in Germany and any observed patterns will almost certainly substantially differ from most developed countries. Hence, it is problematic to transfer the proxy based on solely German data to developing country context. However, using this information on finance from public and private intermediaries would results in a proxy for a mobilisation factor for Germany public finance of **12.4/16.5 = 0.75**.

The Standing Committee of Climate Finance provides a comparison of estimated public and private climate finance flows for 2011. According to UNFCCC Standing Committee on Finance (2014), multilateral and bilateral flows amount to USD 40.5 billion in 2011. Estimations on private climate finance flows based on the years 2008 – 2011 and 2009 – 2010 range from USD 27 – 123 billion and USD 39 – 75 billion, respectively. Hence, the average flows per year are USD 66 billion. Assuming that all the private finance flows are mobilised by public funds from multilateral and bilateral sources, will result in an overestimation, as the data not only includes private co-finance, but also in some instances private finance without not related to public finance. A mobilisation factor based on this data could be calculated as **66/40.5 = 1.6.**

Mobilisation/Leverage reported by public finance institutions

Other sources for deriving proxies for mobilisation factors are studies of public finance institutions and funds providing information on the mobilisation/leverage of their financing. For instance, the IFC (2011) provides information on the leverage ratio of their financing for renewables and industrial EE. Relating private finance volume to the volume of all public finance (IFC and other donors) yields a mobilisation factor of **3.3** for renewables projects and **0.86** for industrial EE.

In many cases, however, these analyses provide leverage factors rather than mobilisation factors. In addition, the leverage ratios are usually calculated in a different way compared to mobilisation as suggested in most of the Scenarios. Leverage is often defined as the respective institution's funds relative to the investment volume i.e. resulting in a co-financing ratio. Hence, these values are typically higher than those of mobilisation factors due to two main reasons:

i. In many cases, the reporting institution considers the total project volume as leveraged finance, whereas the main idea of mobilisation factors is to only consider private finance as mobilised. Hence, the amount being leveraged is typically higher.

ii. Reporting institutions usually attribute the whole project volume to their public finance contribution when calculating leverage factors. Even when other public institutions / donors provide finance for a project, these funds are considered to be leveraged by the reporting institution. Hence, the amount of public finance that is assumed to leverage private funds is smaller than in the concept of mobilisation.

When reviewing leverage factors calculated by public finance institutions and funds these two main differences have to be kept in mind. It is not possible to directly take the leverage factors themselves as proxies for mobilisation factors. Alternatively, the provided data on public and private finance contributions to a sample of projects could be taken to estimate proxies for mobilisation factors. In the following, such proxies are derived from reporting on private sector activities of different donor institutions. It is important to mention that the calculated proxies are very rough estimates based on the largely very limited information.

One source for proxies for mobilisation could be derived based on the experience of the Clean Technology Fund (CTF) (CIF, 2013). This fund aims at scaling up private finance through public finance interventions. As of 28 June 2012, 29 projects have been approved by the Trust Fund Committee. These projects include different sectors, as large renewable energy projects, energy efficiency programmes, and transportation projects, and cover countries in Asia, Africa, Latin America, and the MENA Region. Overall financing of these projects totals USD 13.8 billion, where USD 4.9 billion originates from private source and the reminder, approximately USD 8.9 billion, is public funding, including USD 1.4 billion from the CTF. Hence, the mobilisation factor derived from this sample of projects would be 4.9/8.9 = 0.55. There is, however, a quite high variation among projects. The share of private finance ranges from 12% (a mobilisation factor of about 0.12/0.88 = 0.14) and 78% (mobilisation factor of about 0.78/0.22 = 3.5).

A more recent report provides aggregated project data of all Clean Investment Funds (CIF) approved or in the pre-MDB approval phase as of March 2014 (CIF, 2014). Approved projects total USD 23.6 billion, where private sector financing amounts to USD 5.6 billion. These projects can be disaggregated into public sector and private sector projects and programmes. For public sector projects (USD 17.3 billion) private finance amounts to USD 3 billion, whereas it private finance totals USD 2.6 billion in all private sector projects (USD 6.2 billion). Using these data for calculating a proxy for mobilisation yields three different mobilisation factors:

i. 5,6/23.6 = **0.24** for all climate finance projects,

ii. 3/14.3 = **0.21** for public sector projects,

iii. 2.6/6.2 = **0.42** for private sector projects.

<u>TA Programmes</u>

Information on mobilisation of TA could be derived from TA programmes as the Climate Finance Innovation Facility (CFIF). This programme is funded by the BMUB and is jointly implemented by UNEP and the Frankfurt School – UNEP Collaborating Centre. In this programme, financial institutions in the Southeast Asia apply for Technical Assistance (TA) in order to introduce innovative finance products for climate related investments. Based on the data of finalised projects, it is possible to calculate mobilisation factors of TA provided by CFIF. To do so, it is necessary to define assumptions of the causality of the provided TA funds. The simplest assumption, leading the highest mobilisation factors, would be to presume that the climate investments financed through the introduced finance product would not have happened without the CFIF intervention. Under this assumption, it would be possible to relate the provided CFIF TA budget to all investments in order to derive the mobilisation factor of TA. Based on the current knowledge of CFIF

interventions, the mobilisation factor of CFIF interventions (TA) would be around **17**.[4] It should be noted that this mobilisation factor is an overestimation. First of all, it is based on the assumption that the investments would have been equal to zero in the "business as usual" scenario. Secondly, there is the issue of double counting. Mobilised investments of some projects include other funds from public sources, e.g. public subsidies on the finance products. Hence, not all investments can be counted as private finance mobilised by this TA measure.

Energy Efficiency

Information on the mobilisation effect on German public finance for energy efficiency in housing can be derived from the evaluation of KfW's energy efficiency programme (Prognos, 2014). The main issue of this data source is that it only covers energy efficiency investments in Germany. Hence, it is problematic to apply such a mobilisation factor directly to the development country context. The evaluated programme focuses on energy efficiency refurbishment of existing buildings. The evaluations shows that KfW loans amounting to EUR 3.75 billion and grants of EUR 146 million have led to total investments of EUR 6.48. Private investments can be estimated by subtracting public finance from total investments resulting in a private finance amount of EUR 2.58 billion. Hence, the mobilisation factor of German public finance could be estimated as **2.58 / 3.9 = 0.66.**

iii. Experimental Studies in Development

In addition to studies and data on historical public and private climate flows, non-climate related studies in the field of development finance/economics could also provide interesting insights in the effect of technical assistance and grants on the behaviour of individuals.

Gaurav et al. (2011) conducted an experiment where 600 small-scale farmers in India that where offered rainfall insurances. The authors show that financial literacy training offered to 300 farmers – focussing on aspects as the usefulness of formal hedging of agricultural production risks – has a significant positive impact on the decision to buy the insurance. The authors show that financial literacy training increases the demand for rainfall insurances by 8% - 16%, whereas money back guarantees (equivalent to a grant amounting to 40% of the insurance price) increase the up-take by 7%.

The cost of insurance was USD 18. The financial literacy education costs were USD 3.33 per person. Focussing on the effect of the invitation to the training (not all 300 farmers participated), the experiment shows that an invitation to the training increased up-take by 5.3%. Hence, the costs of technical assistance per insurance policy sold are USD 3.33/0.053=USD 62.83. Hence, this yields a mobilisation factor of technical assistance of USD 18 / USD 62.83 = 0.29. Among the farmers who actually attended the training, the effect on up-take is 7.4%, resulting in a mobilisation factor of 0.4. Gaurav et al. (2011) assume that, in a non-experimental set-up, education costs per participant could be reduced by around 25%. Calculating with these reduced costs, the mobilisation factor of invitations to trainings is around 0.38 compared to 0.53 for training attendance. Combining these results, the mobilisation factor of financial literacy training on investment in insurances is around **0.29 – 0.53**.

In addition, Gaurav et al. (2011) show the effect of money back guarantees on insurance uptake. The authors estimate the total costs of a money back guarantee per unit sold (including the costs of the guarantee itself, marketing, and an administrative fee in case of refund) as USD 43.62 per policy sold (incorporating the effect of the guarantee on up-take of 6.9%). Hence, the mobilisation factor of a money back guarantee is USD 18 / USD 43.62 = **0.41**.

Karlan et al. (2014) conducted several experiments in Ghana analysing agricultural decisions of farmers. In one of the treatments, 230 famers where offered free insurances (the authors estimate the actuarially fair value at USD 47 per acre). These 230 farmers insured 5 acres on average. This results in average costs of an insurance grant per farmer of USD 235. In their empirical analysis, Karlan et al. (2014) show that the total

[4] This estimation is based on the ongoing impact assessment of CFIF interventions.

cultivation expenditure is USD 266 higher for insured farmers compared to the control group. Hence, the mobilisation factor of insurance grants on agricultural investments could be estimated as USD 266 / USD 235 = **1.13**.

Allcott and Taubiksky (2015) investigate the effect of information on the willingness to pay (WTP) for Compact Fluorescent Lightbulbs (CFL). The authors conduct an "artefactual field experiment" using a nationally-representative online platform called Time-Sharing Experiments for the Social Sciences (TESS). TESS contains around 50,000 US households that can participate in computer based experiments. The main part of the experiment consisted of three parts.

i. The participants made choices between two lightbulb packages, where one contained an incandescent lightbulb and the other a CFL, based on a relative price list. Based on these choices, the baseline demand and WTP are derived.

ii. Participants are shown an information screen. This screen informed the participants about, e.g., electricity costs of CFLs compared to incandescent lightbulbs,

iii. After receiving the information, the participants repeat the choices done in the first step.

Based on this approach, Allcott and Taubiksky (2015) estimate the conditional average treatment effect, namely the effect of providing information on energy costs / potential energy savings on the WTP for CFLs. The analysis shows that, on average, the provided information increased the WTP for CFLs by USD 2.30. This average marginal effect of the information treatment could be used as a basis for estimating the effect of TA programmes aiming at information provision. Deriving a mobilisation factor, however, is rather difficult since the study just tests the effect of information (given on an information screen) on the WTP for one product. Hence, it is difficult to derive a mobilisation factor that gives total private investment (expenditure) per public money spend on a, e.g., TA measure. **Not quantifiable in the setup, but significant mobilisation possible (informed guess: in the range of Guarav et al (2011), and Karlan et al. (2014))**.

Giné and Young (2009) conducted an experiment in Malawi where farmers were offered loans from MFIs for hybrid seeds. A control group was offered a "standard loan" whereas the treatment group was offered a loan combined with a rainfall insurance policy with an approximately actuarially fair premium that the farmers had to accept to receive the loan. Somewhat unexpectedly, the insured loans had a significantly lower uptake compared to the uninsured loan. However, looking at the characteristics of individuals shows that the choice to accept the insured loan is positively correlated with education, income and welfare of farmers. Overall, the results of Giné and Young (2009) are in line with McIntosh et al. (2013) that show that no weather based insurances are demanded without public intervention. **Due to setup-problems the impact is negative**.

McIntosh et al. (2013) analyse the effect of vouchers on the demand of Ethiopian famers for weather index insurances (WII). The authors use data on demand for WII from up to 49 Ethiopian villages where these have been offered. McIntosh et al. (2013) show that the presence of subsidies (vouchers) for WIIs, as well as their amount, positively affects the demand for WII. In their study, however, the authors do not find any sizable mobilisation of private spending through the provided vouchers. The subsidy amounts varied between a zero subsidy up to a subsidy that covers up to 70% of the intended coverage for the average sized farm. The data revealed that farmers did not use the voucher amount to cover a certain fraction of the insurance costs for all their land (and finance the rest with own funds), but rather used only the voucher amount to insure the respective fraction of their land. Only 21% of all farmers buying a WII added any private funds and 57% of those farmers adding private funds contributed less than 10 Birr (less than EUR 0.50).

Table 4: Overview of derived mobilisation factors

SOURCE	GEOGRAPHICAL SCOPE AND SECTOR COVERAGE OF THE SOURCE	MOBILISATION FACTOR	
		PUBLIC FINANCE	TECHNICAL ASSISTANCE
Haščič et al. (2015)	Six renewable energy sectors for 769 country pairs for the period 2000-2011	0.3597	
Juergens, I. et al. (2012)	Climate finance flows in Germany in 2010	0.75	
Standing Committee on Finance (2014)	Climate finance flows from OECD to non-OECD countries in 2011	1.6	
CIF (2013)	29 projects financed by the CIF in various sectors (RE, EE; transport) and various developing countries	0.21 – 0.46	
IFC (2011)	Renewables and industrial EE in various developing countries	0.86 – 3.3	
Prognos (2014) (KfW EE)	Energy efficiency investments in the German housing sector	0.66	
Gaurav et al. (2011)	Rainfall insurances; experimental study with 600 farmers in India		0.29 – 0.53
Karlan et al. (2014)	Rainfall index insurance in Ghana; experimental study with ca. 500 households in Ghana		1.13
Allcott and Taubiksky (2015)	Willingness to pay for Compact Fluorescent Lightbulbs; experimental study with ca. 50,000 US households		Not quantifiable

Karlan et al. (2011) conducted another study that did not find any significant mobilisation effect of public funds, in this case guarantees. The authors conducted a field experiment in rural Ghana. Farmers were offered loans where 50% of the loan is forgiven if crop prices fall below a certain threshold. A control group was offered a "normal" loan product. The analysis shows, however, that there is no statistically significance difference in loan uptake between those two groups (uptake rates are 92% in the treatment group and 86% in the control group). **Full use of public money, but no mobilisation.**

Table 4 shows an overview of proxies for mobilisation factors that seem applicable to public finance and TA. Note that, while the proxies for the mobilisation factors for technical assistance incorporate some notion of causality, the majority of the mobilisation factors for public finance are to large extend leverage ratios. In order to derive an actual mobilisation factor, the share of leveraged private finance that is actually mobilised would have to be estimated. An exception is, to a certain extent, the study of Haščič et al. (2015) as these authors econometrically determine the marginal effect of public finance on private finance controlling for other important factors as policies.

3.4. SCENARIO 4: TOP-DOWN APPROACH – DISCOUNT FACTORS

The main methodology for estimating and apportioning mobilised private finance in Scenario 4 is based on private co-financing. Hence, estimation would require some information on co-financed projects including German public finance. One approach would be to use data as provided by IDFC estimation of mobilised private financing, disaggregated by donor country (or public finance institution). It is important, however, to relate this private co-finance of projects with German public involvement to other public sources such that it would be possible to allocate total private co-financing to the respective industrial countries. Furthermore, a discount factor would be required to reflect than only part of the private co-finance attributed to German public finance might be considered as mobilised. This is a main difference to Scenarios 1 and 2, where total private co-financing is considered as mobilised. This discount factor could be estimated based on methods as presented in Scenario 3, i.e. methods assessing how much of the private co-finance would not have been provided without public intervention. An alternative approach for – at least first proxy of – an estimate of such a discount factor is the methodology applied in the OECD RC Study presented below.

i. Insights from an econometrics-based OECD Study

A proxy for a discount factor based on total private finance could be extracted from the econometric analysis of Haščič et al. (2015). The authors simulate the mobilisation of public interventions on private flows based on their econometric analysis. Haščič et al. (2015) simulate the share of total private finance (not just co-financed) flows to renewable energy projects that can be explained by public finance and policy interventions. The authors differentiate between alternative sources of private finance flows (North-South, South cross-border, and all flows to South) as well as sources of public financing (multilateral vs. bilateral public finance flows). According to the simulations, total bilateral (multilateral) public finance has mobilised the following shares of private finance flows:

- 15.7% (14.8%) of all North-South flows,
- 26.5% (17%) of South cross-border flows,
- 42.2% (11.8%) of all private finance flows to the South.

Based on the assumption on origin of private financing that is supposed to be defined as mobilised (here: all private flows irrespective of origin), this analysis provides a good example and first proxy for a DF.

Based on this analysis, 42.2% of all private financing for renewable projects in the South (irrespective of the origin) was mobilised by bilateral public financing. A quantification based on such a DF would require two steps:

i. Calculation of the actually mobilised share of total private co-financing on the bases of total private flows using the **DF of 42.2%**. This yields all private financing mobilised by industrial countries

ii. In order to apportion this total amount to the respective countries providing bilateral public finance, a pro-rate (present value approach) could be used.

Based on the apportioning, donor country specific DFs could be estimated such that mobilised private finance by the respective country could be estimated using the country's specific discount factor. Such a factor could be adjusted periodically. This methodology, however, is based on total private finance and not, as suggested in Scenario 4, private co-finance. However, such a methodology could be applied to private co-financing. A possible similar approach would be the econometrically determine such a discount factor by using a data set that only contains co-financed projects, instead of all projects (see Rodríguez et al. (2015)).

4. DISCUSSION OF PROPOSED SCENARIOS

The Scenarios are discussed along the predefined criteria: accuracy, practicality, incentives, and potential for standardisation.

4.1. ACCURACY

Due to their very nature, the two Bottom-Up Scenarios carry more granularity than the Top-Down approaches. Scenario 2 provides the highest accuracy. It is derived from individual projects and considers both public finance and policy interventions. In contrast, Scenario 1 (including both Sub-Scenarios A and B) is less accurate. It does not consider policy interventions and hence assumes that all private finance was mobilised by public finance only. This means that, e.g., although a donor country provides a FiT-top-up, no private financing is assumed to be mobilised by this country.[5] Hence, Scenarios 1A and 1B are less accurate with respect to attributing mobilisation to donor countries compared to Scenario 2. Within Scenario 1, the Sub-Scenario A is marginally more accurate than Scenario B. Scenario1 A apportions mobilised private finance based on a grant-element approach compared to the pro-rata approach suggested in Scenario 1B. This leads to a more accurate allocation of mobilised finance, since it is based on the actual subsidy (element) provided by the respective donor country and not simply the face value of public finance. Scenario 1B might particularly distort results when, e.g., a grant and a loan are provided for an investment by two different donors. In such a case the donor providing the loan will be able to claim most of the mobilised private financing if apportioning is based on face values that are typically significantly larger for loans. However, the opposite might be the case, when looking at equity investments. A public equity investment might have a small grant equivalent value, while it greatly contributes to de-risking a project. In this case, a face-value valuation might more accurately reflect the role of that equity investment in mobilising private finance than the grant equivalent. Obviously, in all the Bottom-Up scenarios the accuracy is based on the data quality. A seemingly precise formula applied to bad quality data might produce a false sense of accuracy.

A weakness of both Bottom-Up Scenarios with respect to accuracy is that they, conceptually, are not based on causality. They rather follow a "co-financing approach". It is assumed that the respective projects would not have happened without the public contributions and hence the total private financing for the project is assumed to be mobilised. Although in practice probably not too different, the value of mobilised private financing using Scenarios 1 and 2 is not the private finance that was "caused" by public intervention.

Since both Scenarios are project based, double counting should not be an issue. Furthermore, mobilised private finance is assumed to be the investment less all public contributions. Hence, mobilised private finance is directly tied to the project (and does not include any potential spillover effects).

The Top-Down Scenarios are based on estimated average mobilisation- (Scenario 3) and discount factors (Scenario 4). The fact that these factors are estimated on a sample of projects, financing volumes, or studies (etc.) the resulting estimation of mobilised private finance is naturally less accurate as in approaches where mobilisation is measured on a project basis. In general, the level of accuracy is positively affected by (i) the intervals in which the factors are (re-)measured/estimated and (ii) the level of disaggregation (one mobilisation factor for all climate finance vs. sector-/country- specific factors).

Within the Top-Down approaches Scenario 3 seems to be more accurate than Scenario 4. The main reason is that Scenario 3 also considers policy interventions whereas Scenario 4 does not. On contrary, there is a smaller risk of double counting when applying Scenario 4. The basis for estimation is the total private co-finance which is – using previously derived/estimated discount factor factors – attributed to donor countries as their respective mobilised private climate finance. Hence, if it is conceptually defined, there should be no

[5] An example is the GET FiT Premium Payment Mechanism in Uganda, which is a results-based top-up on the existing REFiT on a per-kWh basis, funded by the development partners through donors (http://www.getfit-reports.com/2015/).

double counting in the method. Both Scenarios, however, have the advantage, compared to Scenarios 1 and 2, that they attempt to capture causality.

Deriving mobilisation factors from (studies based on) actual projects has to potential to provide a high accuracy with respect to causality, since such an approach explicitly attempts to capture causality. An issue might be, however, that it might not capture other effects that might cause mobilisation, as any public policy measures. With this respect, an econometric approach provides an advantage, if (ideally) all relevant variables are included. In such an estimation of mobilisation factors, a mobilisation factor of a specific public intervention, let's say public loans, gives the mobilisation effect of this instrument given all other public finance flows and policy interventions. The downside is, however, that the causality is, in comparison the project-based method, captured less accurately.

4.2. PRACTICALITY

The practicality – the feasibility with available data and the time and cost of reporting – is partly indicated by the attempts of quantification presented in Chapter 3. Overall, Scenarios 1 and 3 seem to exhibit the highest practicality. The main reason for the good practicality of Scenario 1, more precisely Sub-Scenario 1b, is that the data needed for 1B is to large extent already tracked by e.g. development banks and seems to be, in cases where the data is not tracked, feasible to implement. The situation for 1A seems to be more complicated as detailed information on the financing conditions of all provided instruments are needed to allocated mobilised private finance based on grant equivalents. However, such an approach might be feasible in the medium run as the OECD already works on a reform of ODA statistics based on risk-adjusted grant equivalents, which are also suggested to be used in Sub-Scenario 1A.

In Scenario 3, the actual estimation/calculation of mobilised private financing is simple: public contributions are multiplied by the respective mobilisation factors. This should be feasible and efficient to implement since the data availability of public funds is in general very good. The more challenging aspect with respect to practicality is the determination of the respective mobilisation factors. As indicated in the previous section, a more frequent, detailed, and disaggregated approach for determining mobilisation factors indeed increases the accuracy, but negatively affects the practicality. Hence, the practicality of Scenario 3 depends on the methodology of determining the mobilisation factors.

Scenario 4's practicality seems to be similar to Scenario 3. The main reason being that it is based on data that is already available: private co-financing. One major challenge will be to determine the discount factor to measure the actually mobilised private (co-)finance based on total private co-finance. Similar to Scenario 3, a more frequent, detailed, and disaggregated approach for determining discount factors might increase accuracy, but decrease practicality.

Scenario 2 is conceptually the most accurate Bottom-Up approach. However, the practicality is rather low. A lot of the information on the project level is not available and it is at least questionable whether it might be available in the medium-run.

Finally, the practicality might be driven by the degree to which a concept requires a political consensus in order to be implemented. In other words, if the choice of a specific methodology has strong distributive implications, i.e. the choice of methodologies largely affects the attribution of mobilised private finance among donor counties, there might be challenges that potentially decrease practicality.

4.3. POTENTIAL FOR STANDARDISATION

Similar to practicality criterion, Scenarios 1 and 3 seem to have the highest potential for standardisation. With respect to Scenario 1B, the data for this approach is already available and collected in several cases (see the DFI's approach). An extension of this method to all relevant donors seems feasible. A standardisation of Scenario 1A also shows potential for standardisation (see argument concerning risk-adjusted grant equivalent of OECD DAC above). Scenario 3 can also be standardised comparably easy. As

soon as a standardised methodology for estimating mobilisation factors is determined, such a method can be applied in principle by all reporting entities. In general, Scenario 4 behaves similarly to Scenario 3.

Scenario 2 seems to be rather challenging to standardise, but a detailed assessment of this approach is rather difficult as, at least within the scope of this study, data availability is insufficient to quantify mobilised private financing in Scenario 2. Likewise, it is unclear whether this will change in the near future.

Note that in principle the caveat related to the requirement of political consensus applies like in the case of practicality. If consensus is needed for standardisation then all methodologies where the specific implementation details have strong distributive implications will be more difficult to be accepted by all parties.

4.4. INCENTIVES

When examining the incentives we work on the assumption that monitoring the private finance mobilised is not only performed in order to generate the information to what extent a formulated target is reached, but also that this measure will be used by countries in order to design their activities in order to maximise this indicator.

Next to the rather technical and political (feasibility) criteria discussed above, generated incentives stand out from an economic perspective. The main issue is to analyse whether the suggested Scenarios provide incentives for donor country governments to maximise climate friendly investments in a cost efficient way. The analysis of incentives of the proposed Scenarios focuses on the seemingly most important potential negative incentives of measuring mobilised private climate finance that seem to differ among Scenarios. There might be the danger that those donor countries have an interest to maximise their attributed mobilised private climate finance which could not be compatible with the overarching political goal. Furthermore, it seems essential to discuss the potential danger that a Scenario provides incentives to use public finance for attractive investments that would have also happened without any public support but can thereby be "transformed" into "mobilised" private finance.

Since all private co-financing is counted as mobilised in Scenario 1, it provides the incentive to allocate public money to investments with a high private contribution. This incentive has the potentially perverse effect that it could induce public finance for projects/technologies that are already commercially viable/mature that might induce future private financing even without public contributions. Another effect could be that public money is spent for projects that would have happened even without public contribution. In these types of projects attracting private co-investors would be particularly easy and the donor could maximise its mobilised private finance. Hence, measurement of mobilised private finance according to Scenario 1 might provide incentives for donors to concentrate on well-developed countries and mature technologies.

Since it does not consider policy interventions, Scenario 1 might induce an inefficiently high use of public financing compared to (the support of) public policy interventions. In case of projects with more than one donor, Scenario 1B provides the incentive to maximise the loan amount since the face value is the base for attributing mobilised private finance in the joint project. In Scenario 1A, that uses the PV/GE of the public finance contributions, there is an incentive to offer very favourable loan conditions that mean an increase the GE of the donor's loan and hence the amount of mobilised private financing attributed to the respective donor. Although the recipient country might profit of such a potential effect, it might lead to inefficiently high public spending by "over-subsidising" public financing. With respect to recipient countries, there is the danger that donors concentrate their public financing on better developed countries (emerging economies), where it might be easier to attract private financing that would be counted as mobilised finance. However, there might be a positive dynamic incentive for less developed economies to politically improve to the conditions in their economies in order to attract more public financing in the future.

Incentives of Scenario 2 are to a large extent similar to Scenario 1. Due to the inclusion of policy instruments and TA into the methodology, a substantial caveat of Scenario 1 is eliminated. Since policy interventions are considered as mobilising in Scenario 2, there should be no substantial bias towards using public financing mechanisms. Hence, there should be also the incentive to use policy interventions (as FiT top-ups) or TA.

Incentives in Scenario 3 largely depend on the degree of disaggregation of the mobilisation factors. If recipient country specific mobilisation factors where estimated, there would be an incentive to provide public financing for projects in countries with high mobilisation factors. This might lead to an effect similar to Scenarios 1 and 2: donor countries might focus on better developed economies where an involvement of private financing is easier and hence leads to higher mobilisation factors. The same effect could be observable for technology specific mobilisation factors. In the medium- and long-run, country-specific mobilisation factors could incentivise recipient countries to improve the investment conditions in order to make the respective country more attractive to donor countries. If an application of Scenario 3 resulted in such a competition for public financing, it could have the positive side-effect of incentivising the improvement of market conditions for climate investments in recipient countries.

The incentives created by Scenario 4 seem to be basically similar to Scenario 3: they largely differ in the disaggregation of the generated discount factors. A major difference is that Scenario 4 does not consider policy interventions or technical assistance. Hence, similar to Scenario 1, Scenario 4 might incentivise the use of public financing in cases where (the support of) public policy interventions might be more efficient in mobilising private climate finance.

5. CONCLUDING REFLECTIONS

In a final step, the main strengths and weaknesses of the different Scenarios are pointed out and some general concerns about the effort to measure and report mobilised finance are pointed out. The following Table 1 provides a summary of the assessment of the proposed Scenarios.

Table 5: Overview of institutions and financial products

	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCNEARIO 4
ACCURACY	Based on projects (+) Scenario A slightly more accurate since it is based on PV/GE Does not consider policy interventions (-)	Based on projects (+) Considers Public Finance and Policy Interventions (+)	Is based on causality concept (+) Estimation based on a sample of (very specific) projects (-)	Is based on causality concept (+) Estimation based on a sample of (very specific) projects (-) Does not consider policy interventions (-)
PRACTICALITY	Data needed is largely already being tracked (particularly for Sub-Scenario B) (+)	Very detailed project level information required (largely not available) (--)	Estimation of mobilisation factors feasible (practicality decreases with level of disaggregation) (+) (-)	Less practical since it is based on private finance data, that has a lower availability compared to public finance data (Scenarios 1 & 3) (-)
POTENTIAL FOR STANDARDISATION	Data is already available / being collected (DFI's approach) (+)	Due to the very detailed project based approach, a standardisation seems rather complicated (-)	Determination of mobilisation factors seems to be relatively easy to standardise (+)	Determination of discount factors seems to be relatively easy to standardise (+)
INCENTIVES	Incentive to provide public finance to projects with high private contribution (+)(-) Only A: Incentive to offer very favourable loan conditions (-) (+) Bias towards financing compared to policy interventions (-)	Incentive to provide public finance to projects with high private contribution (+)(-) Incentive to offer very favourable loan conditions (-) (+) No finance bias: incentives to use policy interventions as well (+)	Incentive to provide public finance to projects with high private contribution (+)(-) No finance bias: incentives to use policy interventions as well (+)	Bias towards financing compared to policy interventions (-)

Overall, a project-based approach based on private co-finance associated public financing (Scenario 1) seems to be the most practical approach. Based on such an approach, the OECD estimated and attributes private finance mobilised by developed countries through bilateral and multilateral public climate finance at USD 12.8 billion in 2013 and USD 16.7 billion in 2014 (OECD, 2015). Such an approach, however, assumes full causality between public and private co-finance and, as such, has the caveat of not taking into account the role played by policy instruments or technical assistance.

As we argue in Scenario 3, there are methodologies / approaches to determine mobilisation factors on the project level. This approach allows estimating private investments mobilised through technical assistance and is closer to actually capturing causality between public interventions and private climate finance and is hence the more accurate method. However, at this point, it is very challenging to derive average mobilisation factors that can be consistently applied to overall public climate finance. Hence, an activity-based co-financing approach seems a good first step to tracking mobilised climate finance, particularly due to its practicality (as it, e.g., builds largely on data that is already being tracked) and potential of standardisation. A methodology based on mobilisation factors should remain in the debate, as they have the potential to consistently capture the mobilisation effect of interventions other than public finance and have the potential to capture causality of public intervention (to a larger extent than co-financing ratios). However, there is more research required on how mobilisation factors – that can be determined consistently on a project basis as the studies above have shown – can be determined more comprehensively in order to be applied to overall public climate finance.

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