BENCHMARKING:

Building the Evidence Base to Maximise Value for Money for UK International Climate Fund (UK ICF) Projects

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List of Abbreviations

ADB	Asian Development Bank
AFD	Agence Française de Developpement
CDCF	Community Development Carbon Fund
CDFs	Climate and Development Funds
CDM	Clean Development Mechanism
CIFs	Clean Investment Funds
COP	Conference of the Parties
CPF	Carbon Partnership Facility
CSP	Concentrated Solar Power
CTF	Clean Technology Fund
DAC	Development Co-operation Directorate
DB	Development bank
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EOCC	Economic Opportunity Cost of Capital
EPS	Energy Performance Standard
ERR	Economic Internal Rate of Return
FIRR	Financial Internal Rate of Return
GCPF	Global Climate Partnership Fund
GEF	Global Environment Facility
GHG	Greenhouse gas
ICF	International Climate Fund (UK)
IDA	International Development Assistance
IDB	Inter-American Development Bank
IFC	International Finance Corporation
IKI	International Climate Initiative (ICI, Germany)
IRENA	International Renewable Energy Agency
KfW	KfW Development Bank
NAMA	Nationally Appropriate Mitigation Action
NDBs	National Development Banks
NPV	Net Present Value
OECD	Organisation for Economic and Co-operative Development
SREP	Scaled-up Renewable Energy Programme
VfM	Value for Money
UNFCCC	United Nations Framework Convention on Climate Change

Executive summary

The UK International Climate Fund (ICF), set up in 2011, is designed to help developing countries adapt to climate change, embark on low carbon growth and tackle deforestation. Ricardo-AEA and MWH Global were commissioned by the UK Department for Energy and Climate Change (DECC) and the UK Department for International Development (DFID) to provide an improved understanding of the use of benchmarks and thresholds for assessing the value for money (VfM) of international clean energy and energy efficiency projects.

Interviews with climate and development funds (CDFs) and development banks (DBs) were complemented by a literature review. Evidence was gathered on the use of indicators to demonstrate the VfM and viability of projects, and also on the evidence base available to develop key indicators / benchmarks / thresholds in UK ICF priority countries.

Key findings of the study:

- DBs and CDFs use a range of criteria when selecting projects for funding. Initially, criteria are used to screen projects so as to exclude those which are not in line with their strategic goals or mandate. This may include, for example, projects which do not meet a host country's sustainability goals.
- For those projects that pass the project screening stage, the selection of projects for funding is often determined by performance in relation to commercial viability. A standard suite of indicators are used to assess the financial performance, such as financial internal rate of return (FIRR).
- DBs and CDFs may set performance benchmarks or thresholds in relation to the financial performance required from projects. For example, the Asian Development Bank (ADB) has set a threshold which ensures a proposed project's FIRR is greater than the proponent's weighted average cost of capital.
- Indicators are also used to assure the economic and social viability of projects, where these criteria are considered important by CDFs and DBs. For example, the European Investment Bank (EIB) states that for a renewable power plant to be deemed economically viable, it must have a levelised cost of energy (LCOE) equal to or lower than the baseline alternative's LCOE, plus a shadow price for carbon emissions adjusting for any differences in expected output profile between technologies.
- Specific indicators and performance thresholds have also be defined for other VfM criteria, such as amount of alternative finance leveraged by an investment. These criteria were more likely to be used in investment decisions by CDFs than DBs. DBs do assess the VfM of their projects, but instead tend to use more straightforward financial or economic performance indicators such as FIRR or economic rate of return (ERR).
- Indicators can be used at different stages of a decision to consider proposed projects for funding. For example, the marginal abatement cost of CO2 is used as a threshold by the Clean Technology Fund (CTF) to ordinarily rule out technological solutions which are in their research and development phase. Emission reductions are therefore achieved at a marginal cost less than USD200/tonne. Average cost per tonne of CO2 saved is assessed by the Global Environment Facility (GEF) to get an idea of how the cost of abatement in one project compares with expectations; if higher than expected, a project is not immediately ruled out, particularly if it is very innovative.

- Projects are usually evaluated based on their own features rather than in comparison with other projects, i.e. projects are considered on a case by case basis.
- Some DBs and CDFs use indicators as part of their first stage screening process or when evaluating whether primary investment criteria have been met in order for a project to be eligible for funding, e.g. the IFC do not consider energy efficiency projects where projected energy savings are less than 15%. Many do not use indicators to benchmark projects to ensure VfM, as it is not required to fulfil their mandate. Examples of indicators used by DBs and CDFs as screens are summarised in the following table:

	Cost per Tonne of CO_2 Avoided in Clean Energy Projects	**Public / Private Co-investment**	**Energy Efficiency Savings**
CTF	USD200/tonne (marginal abatement cost)	Maximum possible	Not used
NCF	Value of GHG emission reductions should be ≥ 10% of project cost	Minimum of 20%	Not used
EIB	Economic benefits > economic costs	Not used	Cost of project < value of energy saved

Data and methodology issues

There is a lack of good data on the performance characteristics of technologies, even for comparable projects. Some technologies are new or are evolving and (a) have limited data with which to benchmark against, even in developed economies, (b) are implemented in heterogeneous sectors and country conditions which can skew comparisons and (c) experience fluctuations in costs which can make the benchmark values outdated in a short space of time. As costs change, benchmarking can become a resource and data intensive process.

- Even when data is available, methodologies used to collect, process and represent data gathered by different entities are not standardised. Hence, comparing indicators like for like outside of an institution's own portfolio is rarely possible.
- It was generally agreed that having more robust benchmark data to use in investment decisions would be a positive development. However, concern was expressed that benchmarks could be used in isolation rather than in conjunction with other data, e.g. project cost being considered but not plant load factor. Or, that thresholds could lead to perverse incentives; if cost thresholds are set so that grants or concessional rate loans are given to more commercially viable projects, higher cost, transformational projects may be neglected.
- Concerns were expressed over of the risks of focusing on one indicator for VfM. This could lead to an over-simplification of complex investment decisions or promoting projects to meet certain targets (e.g. investing in cheaper, less transformational projects to keep a portfolio's overall average project cost low).

Accessibility to funds affects the need to benchmark

- DBs can access more or new sources of funds from capital markets, as opposed to CDFs which are largely reliant on public contributions. CDFs therefore have to justify their money spent more transparently and publically than DBs; VfM indicators can be a useful way to demonstrate good use of donor funds, beyond financial and economic tests.

Conflicting objectives of pursuing VfM

- Most DBs are seeking to significantly increase their share of climate change related spend as a proportion of their investment portfolio. Turning projects away on the basis of poor VfM once financial and economic tests are satisfied could be contrary to this goal.

- VfM can be interpreted as meaning “profitability”. Where this happens, concerns were raised that if investments which provide good VfM were solely pursued or prioritised, it could lead to more commercially viable projects being funded by CDFs and DBs. This could thereby “crowd out” investment from the private sector.

Overall, the study found that the UK ICF is comparatively more focused on VfM than other donors and investors. VfM assessments can provide more informed decision making, achieving desired outcomes at low cost and instituting strong monitoring and evaluation practices for continuous improvements. However, if all DBs and CDFs consulted in this study are to increase their attention on VfM and benchmarking in the future, then the concerns raised above have to be addressed through co-ordinated action.

SECTION 1

Introduction

1.1 Rationale for the Study

The UK government has set up the International Climate Fund (ICF) to provide £3.87 billion, between April 2011 and March 2015, to support developing countries mitigate and adapt to climate change.

An essential requirement for any public sector expenditure is the demonstration of the Value for Money (VfM) of funds invested. This requires an assessment of how effectively the investment achieves its intended outcomes (effectiveness) and the how resourcefully inputs are converted into these outcomes (efficiency). However, assessing VfM in this way can be challenging, since there are frequently no benchmarks for what an effective or efficient investment looks like. Hence, investment decisions are instead based upon other, more standard criteria such as the internal rate of return of an investment.

The overall objective of this study is to address this gap in the evidence base, and provide an improved understanding of the potential benchmarks (including any associated thresholds) that could be used for assessing the value for money (VfM) of international clean energy and energy efficiency projects.

Where appropriate, these benchmarks and thresholds could then be used by the International Climate Fund (ICF) to improve the reliability of their *ex-ante* assessments and therefore how they compare to *ex-post* evaluation results in the future.

1.2 Role of Benchmarking

Benchmarking is a technique that is used to compare the actual or proposed performance and / or cost of an investment using a specific **indicator** (e.g. cost per unit of measure, productivity per unit of measure, or process time of “x” per unit of measure). It therefore allows the comparison of various characteristics of an investment, with those characteristics that are considered best practice, usually within a peer group defined for the purposes of comparison.

These benchmarks can then be used to inform investment decisions by providing an indication of the relative VfM of a project, in comparison to the best practice **benchmark** for the specific indicator. A typical benchmarking process can be seen schematically in Figure 1 .

A variation on this approach is the use of **thresholds**. These can be defined as minimum performance standards that a project must achieve in order to satisfy a target or objective. Usually quantitative, their values can be above or below the value of a certain benchmark indicator.

Benchmarks and thresholds relate to the specific indicator used to measure performance. Further discussion on the selection of indicators is provided in the next chapter.

Figure 1 Typical Benchmarking Process

The benefits of benchmarking include:

- Greater confidence in decision making.
- Assisting with the definition of best practice.
- Improved monitoring, reporting and verification of projects.

However, there are also some limitations associated with the use of a benchmarking approach for informing investment decisions. These are:

- Comparing data with benchmarks and thresholds from different entities, even in the same industry / sector can lead to a distorted picture of performance unless the methodology used by both is fully transparent, understood and standardised.
- Once benchmarks (defined in Section 2) are established, the ability of decision makers to use them can be limited, given competing considerations in the investment decision process and skills/capacity of evaluation staff. It can also be a time consuming and costly process to establish and maintain a suitable dataset against which to benchmark proposed projects or performance.
- Misinterpretation of the reason for benchmarking can turn benchmarks into thresholds (defined in Section 2), thereby changing the use of data and applying benchmarks in ways not intended by the compiler. This can lead to unwarranted criticism of investment decisions if poorly communicated.
- Potential over-simplification of investment decisions, leading to attention being focused solely on the indicator being benchmarked, at the expense of other important factors. This can lead to unwarranted criticism of investment decisions.
- Limited, inconsistent data or data which is not standardised and hence suitable for benchmarking. This can lead to results contrary to the aims of the exercise, e.g. ill-informed and mistaken decisions.

Hence, the processes and communication surrounding benchmarking require a great deal of appreciation and planning before action is taken. This is particularly the case given political sensitivities around official development assistance (ODA).

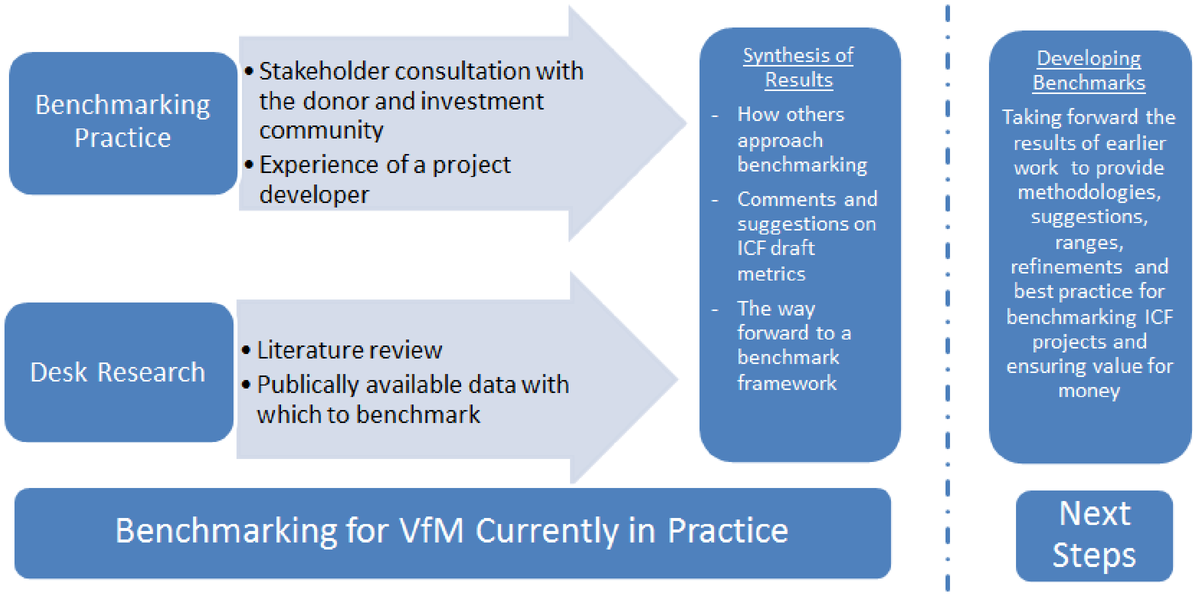
1.3 Methodology

Evidence on the current use of benchmarks and thresholds in VfM assessments was gathered from a mixture of interviews with stakeholders and desk research of published data and reports. This approach is shown in Figure 2.

Interviews were held with a range of stakeholders from the donor and investment community. These were used to better understand their current practices with regard to the use of benchmarks and thresholds, as well as to explore potential options for the further development of benchmarks. A summary of the methodology used for carrying out the consultation process is presented in Appendix B.

The stakeholder interviews were supplemented by a review of relevant literature.

Figure 2 Study Methodology



1.4 Report Structure

Following this introductory chapter, Section 2 provides an overview of key benchmarking definitions. In Section 3 the findings from the stakeholder consultation activities are summarised. Section 4 provides a review of available literature and data, and finally in Section 5 the key research findings from the analysis are summarised.

SECTION 2

Key Terms and Investment Decisions Defined

- VfM is defined as the consideration of the economy, efficiency and effectiveness of an investment. In order to assess VfM using benchmarks and thresholds, two-dimensional indicators are used which combine cost and performance in one indicator.
- Decisions for approving project proposals:
  - First go through a screening process to make sure only suitable projects are considered for investment.
  - Then go through two levels of investment criteria - "primary investment criteria", are critical whereas "secondary investment criteria" are not.
- Benchmarks use indicator values for comparisons whereas thresholds use indicator values as pass / fail tests. Values used for benchmarking may inadvertently be used to set thresholds if clear guidelines for the use of indicators are not defined.
- Whilst some two-dimensional indicators are particularly suited to be "VfM indicators", it must be remembered that the same indicators can be used in other ways, e.g. project screening.

2.1 Overview

This section describes the main types of indicators that can be used to define benchmarks and thresholds to inform investment decision making. It also describes the use of the indicators in each of the key steps of the decision making process that DBs and CDFs use to approve or reject applications for funding of proposed projects.

2.2 Indicators Types

As described in the previous section, benchmarks and thresholds can be defined in terms of specific indicators of performance or cost. Two distinct types of indicators are used for this purpose, as defined in Table 1 . These are "one-dimensional" and "two-dimensional" indicators Table 2 provides some specific examples of each indicator type.

Term	Definition
One-dimensional indicators	Requires one measure of a parameter of interest. Values can be obtained through (e.g.) metering equipment or surveys, and typically standards and methodologies are more established. Examples include number of jobs created by a project or annual megawatt hours generated by a power plant.
Two-dimensional indicators	Obtained by processing the values of one-dimensional indicators in order to generate new indicators. For example, measured activity data multiplied by a calculated emission factor will give the volume of carbon dioxide emitted / reduced as the result of a project. Similarly, the cost of a project divided by the installed electrical capacity of a unit of generation can give an indication of whether a project's installed cost is relatively high or low when compared with another project or benchmark value.

Table 1 Indicators Types

Type of Indicator	Example	Units	Derivation Method	Availability of Standards
One-dimensional indicators	(a) Megawatt hours generated	(a) MWh	(a) Recording of monthly generation data	High; many international (e.g. ISO) and development (e.g. CDM Gold Standard) standards exist
	(b) Jobs created	(b) Number of full time / part time / permanent / temporary jobs	(b) Count how many jobs are created by the implementation of a project	
Two-dimensional indicators	(c) Cost per megawatt hour generated	(c) GBP / MWe GBP / MWth	(c) Divide costs by recorded electrical generation over a period of time	Low
	(d) Cost per job created	(d) GBP / job created	(d) Divide costs by number of jobs created	

Table 2 Examples of One and Two-Dimensional Indicators

One-dimensional indicators are more straightforward to assess and have been more commonly used in investment assessments to date. However, two-dimensional indictors provide additional information that is useful for determining the effectiveness and efficiency of the investment, for example by combining cost and performance information.

However, there are a large number of possible two-dimensional indicator combinations which can be used to benchmark projects and set thresholds. This also means that the selection of two-dimensional indicators is typically less standardised than for one-dimensional indicators. Furthermore, processing data to make two-dimensional indicators may be more time consuming.

Nevertheless, as two-dimensional indicators become more widely used and standardised, they should become more useful in the assessment of VfM.

2.3 Defining Value for Money

VfM is defined as the consideration of the economy, efficiency and effectiveness of an investment. In order to assess VfM using benchmarks and thresholds, two-dimensional indicators are used which combine cost and performance in one indicator

Understanding the conceptual and empirical aspects of benchmarking, particularly for assessing VfM, requires the definition of some key terminologies. For the purposes of this study, DfID's definition of VfM, '*Ensuring Value for money is a continual process involving the consideration of the economy, efficiency and effectiveness of proposed investments*' (1), has been used. The three components of VfM are described below:

- **Economy** relates to how cost-effectively financial, human or material resources are acquired and used in an investment. VfM is typically assessed in terms of the unit costs of inputs involved. At the economy level, VfM focuses on cost control, and it is important to scrutinise the unit costs of key VfM drivers, such as personnel costs, procurement costs, travel costs, and other costs, and then compare these costs to the quality received and examination of key cost/value ratios.
- **Efficiency** relates to how resourcefully inputs are converted into outputs and subsequent outcomes. Cost efficiency measures can throw light on options for a donor investment (e.g. will outcomes be achieved more efficiently by a donor managing an activity directly

or setting-up a project management unit). VfM is typically assessed on how quickly, accurately, and sustainably outputs can lead to desired outcomes. Quality and approach are keys to maximising VfM.

- **Effectiveness** relates to how successfully an investment achieves its intended outcomes and subsequent impacts are realised (e.g. in attracting additional private financing to fund infrastructure investment, increasing the capacity of infrastructure operations, expanding access of target populations). VfM is typically assessed by whether or not the milestones and targets of observable verifiable indicators are achieved.

There is no internationally, standardised recognised definition of VfM. However, the OECD has also said that Value for money (VFM) is about striking the best balance between the "three E's" − economy, efficiency and effectiveness. It is not a tool or a method, but a way of thinking about using resources well. In the United Kingdom it is often used as a framework for assessing cost effectiveness across the public sector" [(2)].

2.4 The Investment Decision Framework: Screening and Investment Criteria

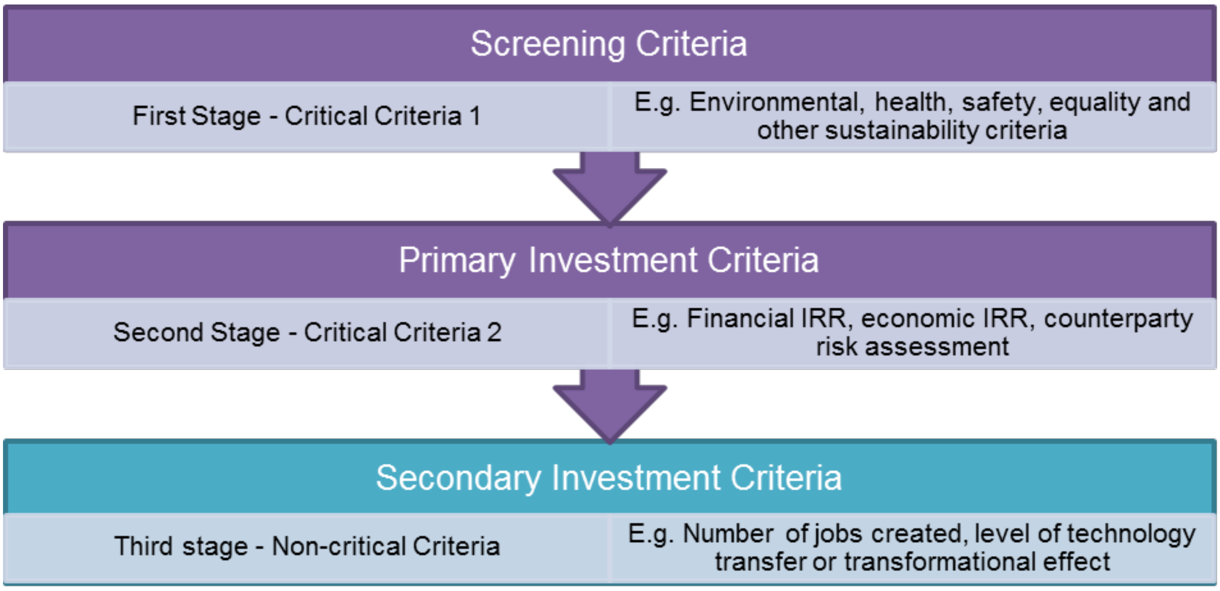
Projects are firstly screened by DBs and CDFs to rule out those which are not in line with their goals or mandate. After screening, there are two levels of investment criteria. "Primary investment criteria" are critical tests which show conformance with a DB's or CDF's minimum performance standards, whilst "secondary investment criteria" show how well a project is aligned with goals or stated performance expectations

It is important to understand how indicators are used by DBs and CDFs in their investment decision making process. These indicators can be used to meet both "screening criteria" and "investment criteria" (

Figure 3). In summary:

- Screening criteria are critical tests used to prevent projects which are unsuitable or not viable for funding. For example, if a project is a net carbon dioxide source rather than a sink, a project's application for funding can be rejected at the earliest opportunity.
- Primary investment criteria are critical tests to ensure only commercially and / or economically suitable projects are considered for funding (as defined by each DB or CDF). For example, if a project's financial analysis reveals that the project cannot service its debts and it is requesting a loan, then its application for funding can be rejected at the earliest opportunity.
- Secondary investment criteria are not critical but may give an idea as to the expected performance of a project. Even if these are consistently forecasted to be not in line with expected benchmark values, a project may still be funded due to its overall net benefits, even if they are not as high as past experience or third party literature may suggest.

Figure 3 Screening Criteria and Investment Criteria



A practical application of the screening and investment criteria for the Clean Technology Fund is shown in Table 3 .

Stage	Requirement / Consideration
Screen	The project must be aligned with a country's national priorities. Chile for example has prioritised the use of domestic generation capacity from renewables. Hence, projects to upgrade grid infrastructure to import more energy may be screened out. The Clean Technology Fund disperses funds via DBs, this means that proposed projects will need to pass the DB's screens too (examples are given in Appendix F). Also, CTF co-financing will not ordinarily be available for investments in which the marginal cost of reducing a tonne of CO_2-e exceeds US$200. The CTF therefore uses screens to assess ***whether*** a project fits with the fund's objectives.
Primary Investment Criteria	The CTF has strict primary investment criteria to ensure that projects cannot be financed by the balance sheet of the disbursing DB alone. A project should have (a) negative rate of return, (b) rate of return below normal market threshold, (c) rate of return above normal market threshold, but below risk premium for project type, technology, sector or country, or (d) rate of return above normal market threshold, but acceleration of low carbon investments has higher opportunity costs. Please see section 3.3.3. The CTF therefore uses primary investment criteria to assess ***whether*** a project fits with the fund's objectives.
Secondary Investment Criteria	The CTF's guidelines state that the cost effectiveness of projects should be measured in terms of average cost per tonne of carbon dioxide reduced. However, the CTF has concluded that "comparing such calculations among projects/programs, especially those in different sectors or using different technologies or financial instruments, may not provide useful information for making funding decisions". Hence, average cost per tonne of carbon dioxide reduced by a proposed project falls under "secondary investment criteria". In this way, the CTF can use this indicator, along with others (such as the degree to which the project is expected to have a transformational effect) to assess ***how well*** a project fits with the fund's objectives.

Table 3 Applying the Model to the CTF's Decision Process

Table 4 outlines the difference between screening and investment criteria and provides examples of each. Screening provides a first stage filter, to ensure that projects not meeting an investor's objectives, mandate or other core requirements are not considered for investment. Primary investment criteria are more often critical than secondary investment criteria as they assess the commercial and economic viability of investments.

Criteria	Example	Definition
Screening criteria.	(a) Energy efficiency projects should achieve "X"% energy savings against the baseline scenario. (b) Projects should meet a minimum performance standard of less than "Y"tCO_2 emissions during operation.	Screening criteria establish quantitative thresholds or qualitative rules in order to screen out projects that do not conform to the objectives, mandate or other core requirements of an DB or CDF. In example (a), a threshold set high enough can be used to screen out proposals showing emission reductions at a low level that may be achievable by good housekeeping. In example (b), a threshold set high enough means that whilst profitable, a coal power plant is not considered as an option in the decision process whereas a combined cycle gas turbine project would be.
Investment criteria.	(a) Financial internal rate of return (FIRR). (b) Economic internal rate of return (ERR). (c) Net cost per tonne of carbon dioxide saved. (d) Cost per MW installed.	Investment criteria can be used to set benchmarks and thresholds to assess the financial and economic case for projects ((a) and (b)), or the efficacy of each unit of investment in achieving emission reductions, installing new generation capacity etc. ((c) and (d)).

Table 4 Screening Criteria and Investment Criteria

A negative assessment of the indicators used for the screening and primary investment criteria may lead to an application for funding being rejected. Secondary investment criteria and associated indicators are not always 'critical' in the decision process but do influence decision making. If indicator values are not favourable, further investigation into the project's case for funding may be triggered, and funding is not necessarily ruled out.

Benchmark values are often used to assess performance amongst a range of other indicators. This is because a project may not reach cost or performance expectations at first examination, but this may be explained and justified after further investigation. For example, a project which has a high cost per megawatt installed capacity may at first seem poor VfM, but if it has a particularly high plant load factor (i.e. is situated in an area of abundant natural resources) then a high capital cost may be justified. It should also be noted that investment decisions and hence uses of benchmarks / thresholds can depend on who is using them, as shown in Table 5 .

Type of investor	Mandate	Examples of benchmarks used	Examples of thresholds used	Rationale
Commercial bank	A commercial bank's mandate is to invest in projects which can pay back a loan at commercial rates, plus a margin.	Project cost should be in the range of those as expected in other comparable projects, or justification for higher costs should be provided.	Project income should be sufficient to cover the cost of a loan at a commercial rate.	As per above, even though a project's cost is high, it need not be immediately ruled out for investment. As a power project, it could for example be guaranteed a particularly high sale price for power generated which could justify the higher capital expense. However, no project will be financed if it cannot service its loans.
Development bank	A development bank's mandate also starts with investing in projects that can service (often concessional rate) debt. Projects which satisfy screening criteria, primary investment criteria and also facilitate (e.g.) sustainable development or the alleviation of poverty are considered.	Project cost should be in the range of those as expected in other comparable projects, or justification for higher costs should be provided.	Project income should be sufficient to cover the cost of a loan at a concessional rate.	A project could have a high capital cost due (e.g.) being first of its kind in a developing country or provide electrification to a relatively high number of households in a region. Hence, even if project cost is high, if the economic co-benefits are also high, the project will be considered for investment if able to service the cost of a (typically concessional) loan.
Multilateral climate and development fund (public lending).	The mandates of development funds vary considerably. For the purposes of this report, the important distinction is that typically, commercial returns are not required when funds disburse money to public sector projects in the form of grants.	A project should generate a volume of emission reductions comparable with an equivalent project (ideally in the same sector and country).	The marginal cost per tonne of carbon dioxide avoided should be below a determined value.	As an example, a fund can be set up with a view to promoting mature / emerging renewable technologies or technologies at the research and development stage. In the case of the Clean Technology Fund for example, a threshold in order to screen out technologies in the research stage is used[3].

Table 5 How Benchmarks and Thresholds May Be Used by Different Types of Investor

2.5 Use of Indicators, Benchmarks and Thresholds in Decision Making

Indicators for benchmarks and thresholds used during the screening, primary and secondary investment decision stages could be used for VfM assessments. Benchmarks and thresholds use indicator values for comparisons and pass / fail tests respectively. Values used for benchmarking may inadvertently be used to set thresholds if formal clear guidelines for the use of indicators are not defined

The definitions for indicators, benchmarks and thresholds (as given in Section 1) need to be borne in mind as terms are often employed together:

- Indicators are used to set thresholds and benchmarks.
- Benchmarks, based on indicator values, can be considered as thresholds too.
- Thresholds are based on indicator values. They often use indicator values which could be used as benchmarks, but the investor or donor has made a policy decision to turn them into thresholds.

Table 6 shows how benchmarks and thresholds used during the screening, primary and secondary investment decision stages could be used for VfM assessments. Three key points emerge from this table:

- Two-dimensional indicators such as average cost per tonne of CO_2 saved or LCOE can be used as a benchmark (e.g. by the GEF) or as a threshold (e.g. by the EIB) respectively.
- Thresholds are used in critical tests for investment decisions.
- Benchmarks are used as secondary investment criteria and are useful for flagging items for further investigation; this should lead to a more informed VfM assessment.

The fact that indicators used for benchmarks can also be used for thresholds merits particular consideration. For example, the International Renewable Energy Agency (IRENA) reports that in India and China, the cost to install onshore wind generation capacity is between 1300-1450 USD/kWe at 2010 prices and exchange rates[(4)]. This is a benchmark cost, derived from studying the costs of installation in each country and providing an average based on primary and secondary research. However these values can also be used as a threshold, depending on the policy of the decision making entity. Appendix C demonstrates how a proposed project's application for funding may be considered differently depending on whether the cost values reported by IRENA are considered as a benchmark or a threshold.

Investment decision	Indicator Example	Benchmark	Threshold	How This Informs VfM Assessment?
Screening criteria (critical test - environmental, health, safety, equality and other sustainability criteria)	Marginal cost per tonne of CO_2 saved		Marginal cost of USD200/tonne of carbon dioxide saved (CTF).	According to the International Energy Agency (IEA) USD200/ tCO_2 is the lower-end estimate of the incentive needed to achieve the objectives of the "Blue Map Scenario". In this way, technologies still in the design phase or delivering results comparable to existing technologies but at a higher marginal cost are screened out, thereby ensuring VfM.
	Private / public sector finance leveraged		Projects must be co-financed to a minimum of 20% of project cost from other sources (NCF).	This ensures that NCF funds can be used in more projects than if 100% of project costs were met, but also ensures that project proponents and other sources of funding are engaged with the project, giving a higher chance of success and thereby providing value for money.
Primary investment criteria (critical test)	Levelised cost of energy		The LCOE should be below the LCOE of the alternative to the project (e.g. a fossil fuel plant) plus a shadow price of carbon (EIB).	In setting a relative threshold, the EIB makes sure that from an economic perspective, the proposed project is better value for money than the baseline alternative. As a cross check, many organisations use publically available data such as that provided by IRENA or the IEA to ensure values are within expected ranges.
Secondary investment criteria (non-critical test)	Average cost per tonne of CO_2 saved	Specific cost per tonne rules do not exist, however if a project's cost per tonne is unusually high, the investor or donor may seek further clarification as to why costs are higher than expected. However, if after clarification / inspection, the cost estimate still remains high, then the project may still be funded, particularly if it is very innovative in nature (GEF).		In this way, the cost of carbon dioxide is used to signal to a donor or investor that the project has a high cost compared to the amount of carbon dioxide saved. The "red flag" raised by a high cost per tonne therefore prompts further investigation which should lead to a more informed VfM assessment. For example, a policy support project as opposed to a capital investment project may have emissions reductions as an outcome after the term of the project. This may still get funded even though cost per tonne of carbon dioxide avoided is higher than expected.
	Private / public sector finance leveraged	Past experience may show what level of co-financing should be achievable but if not reached, then a project may still be eligible for funding, especially if it is expected to leverage further finance in the future (GEF).		By benchmarking the amount of co-financing, a proposal where the level of co-investment is thought to be lower than average can be investigated further. The "red flag" raised by a low co-investment ratio therefore prompts further investigation which should lead to a more informed VfM assessment.

Investment decision	Indicator Example	Benchmark	Threshold	How This Informs VfM Assessment?
	Levelised cost of energy	Used for information purposes by bank staff as a crosscheck. However, it is not a requirement by management to use this indicator (ADB).		A project's initial capital cost may be high. However, if another indicator such as benchmark LCOE is also compared, it can give a more accurate view of the economics of a project. The "red flag" raised by a high project cost therefore prompts further investigation into the economic benefits of the project, which should lead to a more informed VfM assessment.

Table 6 Indicators for Benchmarks, Thresholds, Screening and Investment Analysis

Note: Examples of DBs and CDFs in brackets show how indicators are currently used in the screening and investment decision stages.

2.6 Indicators Used in Value for Money Assessments

Whilst some two-dimensional indicators are particularly suited to be "VfM indicators", the same indicators can be used in other ways, e.g. amount co-invested by the public or private sector can be used for VfM assessments and for project screening

In terms of investments in renewable energy and energy efficiency projects and considering VfM, we have considered a number of key two-dimensional indicators. These can allow projects to be benchmarked, with the potential that the same indicators can be developed into thresholds. As they are two dimensional indicators, they can potentially assist with the assessment of VfM in an efficient manner. The key indicators considered and discussed in detail in the report's next section, are summarised in Table 7 and may be collectively termed "VfM indicators".

Indicator	Units	Explanation
Cost per tonne of carbon dioxide saved	£ / tCO_2	The amount of carbon dioxide abated against the baseline scenario for every pound sterling of investment in a project
Cost per megawatt of renewable power installed	£ / MWe	The amount of megawatts of renewable power installed for every pound sterling of investment in generation equipment
Private sector finance leveraged	Ratio	Volume of private finance mobilised for climate change purposes as a result of ICF funding
Public sector finance leveraged	Ratio	Volume of public finance mobilised for climate change purposes as a result of ICF funding
Levelised cost of energy by technology	£ / MWh	Cost per unit of power produced of building and operating a power plant over an assumed financial life and load factor
Cost per person of access to clean energy	£ / person	The cost of providing clean energy to people as a result of the project

Table 7 Value for Money Indicators Considered in this Study

SECTION 3

Practical Experiences in Assessing VfM

- CDFs and DBs assess projects using indicators, benchmarks and thresholds in different ways depending on the type of financial instrument being considered:
  - Where a DB or CDF is providing loans, they will typically weight economy and efficiency slightly higher in their evaluation of VfM than if offering grants.
  - Where a DB or CDF is providing a grant, they will typically weight effectiveness higher in their evaluation of VfM than if a return on investment is required.
- Some CDFs and DBs use indicators (e.g. cost per tonne of CO_2 avoided) which could be used for VfM evaluations to assess projects against screening or primary investment criteria. Many do not use indicators to assess VfM (e.g. cost of access to clean energy) as it is not required by their guidelines or legal procedures.
- Indicators in use today are mainly used to ensure screening and primary investment criteria and not to assess VfM. Hence, the evidence base around which to screen projects and prove commercial, economic and social viability is also more developed than it is for VfM assessments.

3.1 Overview

This chapter summarises current experience in assessing VfM across a number of DBs and CDFs. A bilateral fund (BLF) and project developer also participated in the consultation process. In general, with respect to VfM assessments, there is no difference in activity between CDFs and BLFs, or between multilateral DBs and national DBs. Hence, unless otherwise indicated, the consultation participants shall be grouped and referred to as DBs and CDFs.

The conceptual discussions on the use of VfM indicators in Section 2 have been applied in this section to present the findings of the project's stakeholder consultation. The list of indicators which can be used to assess VfM, described in Table 7 in the previous section, were the main focus of the consultation.

3.2 DBs' and CDFs' Differing Mandates and Goals

Assessment of VfM is carried out differently depending on whether a grant is provided, where no repayment is required, and a loan

Please see Appendix D for a list of DBs and CDFs that participated as stakeholders in this study. DBs and CDFs have a wide range of mandates and goals. For example, the goal of the Scaling-up Renewable Energy Programme (SREP) is to pilot and demonstrate low carbon technologies in the energy sector in multiple regions. The Asian Development Bank's (ADB) core mandate is to alleviate poverty in the Asia-Pacific region. See Appendix E Goals of Different Financial Institutions

for a summary of the main goals and mandates, sources of funding and the cost of capital for the different DBs and CDFs.

Hence, DBs and CDFs have a variety of financial instruments and investment mechanisms to achieve their differing goals and mandates.

In general, if a DB or CDF needs to ensure a viable return on investment as well as delivering development outcomes, then its selection, use of and weighting of financial and economic indicators will be different to an entity which does not have such a requirement. However, it would be incorrect to assume that because a DB is making a loan, it is only (or primarily) interested in returns on investment. Equally, it would be incorrect to say economy and efficiency are disregarded when a CDF is providing a grant.

Comparatively, an entity that has a mandate to mitigate climate change, such as a climate fund, may assign a higher importance to an indicator such as cost per tonne of carbon dioxide saved than another entity which is providing loans. The latter may focus more on a financial indicator such as FIRR. For example, the CTF, a CDF, uses cost per tonne of carbon dioxide avoided by a project as a measure of cost effectiveness. However, the EBRD's mandate as a development bank is to foster the transition to a market economy by investing primarily in private sector projects[(5)]. Hence monitoring cost per tonne of carbon dioxide avoided as a result of its projects is not such a priority in comparison to the CTF. It can therefore be seen that depending on the mandate, two DBs/CDFs investing in the same project type (e.g. a renewable power plant) will be considering potential investments differently. This would include different views and methods for assessing VfM.

It should be noted that CDFs do provide private sector loans, and DBs make use of a wide range of financial instruments and services, including the administration of grants. For the purposes of this study however, the CDFs' activities are considered with respect to their provision of grants, and DBs' activities are considered with respect to their provision of loans.

3.3 DBs and CDFs Use of Indicators

All DBs and CDFs make use of screening criteria for investment decisions. Climate and development funds are however more likely to use VfM indicators in investment decisions

In this section the main indicators used by DBs and CDFs to make investment decisions are summarised. The first stage screening process is common to both DBs and CDFs; they are discussed in section 3.3.1. However, DBs' requirement for a return on investment to cover the cost of borrowed capital is a key difference. Hence, the use of indicators after screening is considered separately for these two types of entity (sections 3.3.2 and 3.3.3. respectively).

3.3.1 Screening Process Used by DBs and CDFs for Investment Decisions

Screening criteria allow DBs and CDFs to rule out projects based on whether they are in line with their overall goals or mandate. An example is screening out fossil fuel projects when clean energy is the focus of the DB/CDF. As discussed in Table 6 , VfM indicators can be used in different stages of the investment decision process. Examples of VfM indicators used in the screening process are shown in Table 8 . Appendix F provides a detailed overview of screening criteria used by the DBs and CDFs in the consultation, as well as a brief comparison of how indicators are used differently as screens by the EIB and IDB.

Indicator used to Screen Projects	Use of Screens by the Clean Technology Fund (CTF), Global Environment Facility (GEF), the Nordic Climate Facility (NCF), European Investment Bank (EIB) and Asian Development Bank (ADB)
Cost per tonne of carbon dioxide saved	The **CTF** is a fund which uses a screen which means it will not ordinarily fund projects and programmes with a marginal cost of carbon dioxide abatement greater than USD200/tonne. However, as per the Trust Fund Committee document CTF/TFC.12/7, "Cost-Effectiveness of CTF Projects" (October 8th, 2013), data to demonstrate this criterion had been met was "seldom" supplied by project proponents; this threshold was not used operationally at the time of writing of this paper. Hence, in a later decision, the CTF streamlined reporting requirements in this respect stating: "Since the technologies supported by the CTF are typically far below that threshold, it is suggested that instead of requiring every project/programme to undertake marginal abatement cost analysis, the country is requested to provide information on the estimated marginal abatement cost only for projects/programmes for which the marginal abatement cost is likely to exceed USD100 per ton of CO2-equivalent."(6) **The GEF** will reject a proposed project if the cost per tonne of carbon dioxide is too high; although there are no rules or a set threshold value specifying what is "too high". **The NCF** also uses cost per tonne of carbon dioxide as a screen. Their guidelines state "Projects should have a significant climate component, i.e. the global benefits of GHG emission reduction or carbon sequestration should be at least 10% of project investment costs. Determining "significance" requires an estimation of the annual reduction in greenhouse gas emissions over the lifetime of the project, i.e. a "with and without project" comparison. This includes an assessment of net changes – which may be positive or negative – in GHG emissions during the project construction phase. Complex technical assessment will typically be required of the impacts of such activities as energy efficiency investments; replacement of fossil fuels by renewable sources; transport investments; or carbon sequestration. The annual global benefits of reducing GHG emissions should then be calculated by multiplying the reduction in the number of tons of CO_2 emitted by a figure representing the social value (in monetary terms) per tonne of such reduction. The present worth of the stream of annual global benefits of greenhouse gas emission reduction stemming from the project should then be compared with project investment costs. The test for climate significance is passed if the present worth of benefits exceeds 10% of project investment costs. Assumptions about critical variables are required to be highlighted where major uncertainties exist - in particular the value per tonne of CO_2 emission reduction that would satisfy the 10% criterion." The **EIB** uses a shadow cost of carbon within its standard project economic test. Hence a mitigation project will need to demonstrate that the benefits of the project (including the carbon saved) outweigh the costs.
Public and private sector finance leveraged	**The CTF**, **the GEF** and **the NCF** all require co-investment in order to disburse funds for a project. However, only the NCF specifies a minimum threshold value. The CTF and GEF provide the capital necessary in order to make investments in projects viable; hence, the level of co-investment needed will change on a case by case basis. The NCF's investment guidelines state that 20% of finance for each project should come from other sources.

Indicator used to Screen Projects	Use of Screens by the Clean Technology Fund (CTF), Global Environment Facility (GEF), the Nordic Climate Facility (NCF), European Investment Bank (EIB) and Asian Development Bank (ADB)
Energy saved against a baseline scenario	**The IFC** states that for proposed energy efficiency projects, the outcome must be a reduction in total energy consumption by at least 15% against the baseline scenario. **The EIB** requires that "the net present cost of the project over its life is less than the net present value of the energy saved, including externalities. In addition, the Bank screens projects with the objective of ensuring that they are motivated by energy efficiency rather than simple replacement."[(7)]
Economic Rate of Return (ERR)	**The ADB** has set a threshold of ERR > 10% in order for a proposed project to merit consideration for investment. The economic justification of the project is based on comparing benefits and costs as they occur over time, using an appropriate discount rate. A project investment is economically justified if the estimated economic rate of return (ERR) exceeds the economic opportunity cost of capital (EOCC) for the country. Given the difficulty of estimating country-specific EOCCs, the EOCC for all ADB developing member countries is 12%. However, an EIRR of 10%-12% is acceptable if the project is deemed to have significant unquantified net benefits.
Levelised cost of energy	**The EIB** stipulates that for a "mature renewable power plant to be deemed economically viable, it must have an LCOE equal to or lower than the alternative" [plus a shadow price of carbon], adjusting for any differences in expected output profile between technologies.
Other	**The ADB** requires that a project's FIRR > WACC of the project proponent.

Table 8 Indicators Used by DBs and CDFs as Part of the Screening Process

It should be noted that as in other aspects of this study and indeed financial investments in general, there are exceptions to available guidelines for use of these indicators. A notable one is the CTF which, for cost-effectiveness purposes, will not *ordinarily* invest in projects with a marginal abatement cost of carbon dioxide greater than USD200/tonne. However, the use of the word "ordinarily" in the guidelines allows for exceptions to be made at the discretion of the CTF Trust Fund Committee.

3.3.2 Development Banks' Use of Indicators

Since this study is limited to CDFs providing grants and DBs providing loans, and given their differences in mandate and screening criteria, a difference can be seen between their respective use of indicators. The main message received from the DBs was that after the project screening process, only primary investment criteria (defined in Section 2.3 of this report) were critical in the decision to proceed with the project. Table 9 and Table 10 provide examples of primary investment indicators and how they may be used respectively. DB's have development assessment tools to evaluate *ex-ante* and *ex-post* projects' performance with respect to development goals. The different tools and assessment frameworks to track development outcomes are summarised in Section 4.

Conventional primary investment criteria are employed by almost all banks throughout the world, development or commercial (Table 9). There are many ways to demonstrate the financial, economic and risk profiles of projects. In Table 9 , four ways of calculating financial returns, three ways of demonstrating economic returns and three risk assessment methods are shown. A banking institution may use one or more indicators for each type of primary investment criteria in order to provide assurance on its investment. One of the key concerns raised by DBs when discussing benchmarking was the potential for over simplification of the decision process by the use of indicators and benchmarks in isolation, rather than using a suite of indicators.

The EIB uses a shadow price of carbon in their economic analysis for investment decisions. This could strengthen the economic viability of renewable power projects compared to a fossil fuel alternative. Hence, projects which otherwise may have had their application for funding rejected on economic grounds may be eligible to proceed.

It is through the use of indicators in Table 9 that commercial and economic viability of projects are assessed.

Primary Investment Criteria Type	Indicator	Details[8]
Financial	Internal Rate of Return (FIRR)	The FIRR of a project measures the rate of return earned by the project based on discounted cash flows.
Financial	Financial Net Present Value (FNPV)	The NPV of a project is the sum of the present values of the expected cash flows of a project, net of the original investment.
Financial	Debt Service Coverage Ratio (DSCR)	A measure of the cash flow available to service debt (principle and interest) to a lending institution in a given period (e.g. month / year).
Financial	Loan Lifetime Coverage Ratio (LLCR)	A measure of the cash flow available to service debt (principle and interest) to a lending institution over the lifetime of a loan.
Economic	Economic Rate of Return (ERR)	The ERR can be calculated the same way as FIRR but it takes into consideration factors such as environmental externalities and market distortions such as price controls, tax breaks and subsidies.
Economic	Levelised Cost of Energy (LCOE)	Represents the real terms per-kWh cost of building and operating a power generating plant over an assumed financial life and duty cycle.[9]
Economic	Economic Net Present Value (ENPV)	The ENPV of a project is the difference between discounted benefits and costs at a given discount rate.
Risk	Project risk	Comprised of e.g. technology and construction risk.
Risk	Counterparty risk	The risk of a counterparty not delivering the project, bankruptcy or other default.
Risk	Country risk	The risk of e.g. sovereign default, exchange rate volatility or political instability.

Table 9 Examples of Primary Investment Indicators Used by DBs

Table 10 outlines how primary investment indicators can be employed by using theoretical example values. An actual example is that the ADB specifies that the financial internal rate of return (FIRR) of a project must be greater than the weighted average cost of capital (WACC) of the borrower; this is logical, as the return on capital invested in a project should be greater than the cost of that capital. In this case, the WACC is used as a financial benchmark rate of return. Another DB / CDF could use another benchmark rate of return e.g. LIBOR plus a margin or expected bond yields in the proposed project's host country.

Indicator	Theoretical Examples of Indicator Use
Internal Rate of Return (FIRR)	FIRR should be greater than a set benchmark value e.g. the borrower's weighted average cost of capital (WACC). This example is taken from the ADB's investment guidelines.
Net Present Value (NPV)	NPV should be greater than a certain value (e.g. greater than zero).
Debt Service Coverage Ratio (DSCR)	A minimum ratio of income to monthly / annual debt service payments (e.g. greater than 2.5:1) should be achieved during a certain period in a loan term in order for a loan to be approved.
Loan Lifetime Coverage Ratio (LLCR)	A minimum ratio of income to debt service payments over the life of a loan (e.g. greater than 2.2:1) should be achieved over the life of a loan in order for a loan to be approved.
Economic Rate of Return (ERR)	ERR should be greater than a certain value (e.g. greater than zero).
Levelised Cost of Energy (LCOE)	For a proposed project to be deemed economically viable, it must have an LCOE equal to or lower than the alternative identified in the baseline scenario, adjusting for any differences in expected output profile between technologies. (this example is taken from the EIB's investment guidelines).
Economic Net Present Value (ENPV)	ENPV should be greater than a certain value (e.g. greater than zero).
Project risk	Projects with a penetration rate of less than a certain percentage (e.g.10% contribution to electricity generation mix) in a target country are too much of a risk to finance, as there may be a domestic skills shortage in the target country.
Counterparty risk	A counterparty who has not implemented at least (e.g.) one project equivalent to the proposed project presents too great a risk due to inexperience of delivering such projects.
Country risk	Territories ranked below a certain position (e.g. number 150) in an index of 185 sovereign countries present too much of an investment risk.

Table 10 Examples of How Primary Financial Indicators Can be Employed

Some of the indicators chosen in this study to discuss VfM in project investments were used by DBs, although not explicitly for the purpose of benchmarking to maximise VfM. An example of this is that all DBs scrutinise cost per megawatt of installed renewable power capacity. However, this is more of a due diligence consideration for development banks, (e.g.) to ensure investors do not overestimate project costs to get more funds at concessional rates. None of the DBs consulted specified that they believed a low cost per megawatt alone could be an indication of VfM.

3.3.3 Climate and Development Funds' Use of Indicators

VfM indicators as shown in Table 7 were found to be used more by CDFs in their decision process, in comparison with DBs. This is for two main reasons:

1. Unlike DBs, opportunities for raising new financial resources for CDFs are relatively limited hence there is a greater need to publically demonstrate VfM of funds invested. DBs can return to investors or capital markets in order to raise capital more readily than a CDF who rely on funding calls for re-capitalisation from governments.
2. The larger CDFs (i.e. CIFs and GEF) do not ignore the financial and economic returns of public sector projects. However, CDFs do in general emphasise more on the effectiveness of spend and focus relatively more on the sustainable development aspects of projects. This is partly as they invest through intermediaries who are more specialised at investment analysis.

As noted in Appendix E Goals of Different Financial Institutions

, there are three CDFs (NCF, Carbon Partnership Facility (CPF) and Community Development Carbon Fund (CDCF)) which have an alternative way of operation and method to ensure VfM. The CPF and CDCF assess a proposed project's eligibility, baseline scenario, additionality, and likelihood of registration with a crediting mechanism (e.g. CDM) before investing. Some development and registration costs could be paid in advance, but the majority of the investment is disbursed once carbon credits have been generated. Hence, a significant way those funds ensure VfM is by paying on results.

Both the CPF and the CDCF monitor cost per tonne of carbon dioxide reduced at the fund level. Both funds also have two mandates, the first is common and is the generation of certified emission reductions (CERs). The second is policy related and distinguishes the two funds. Broadly, the CPF seeks to innovate in scaling up carbon finance, initially through utilising the CDM Programme of Activities modality. The CDCF promotes CDM projects that combine community development and emission reductions targeting the poorest regions of the world. Thus it seeks to expand the CDM into areas where private sector developers may not invest in CDM projects, e.g. in least developed countries (LDCs) or very small scale projects that also generate local community benefits. Hence, whilst fund managers have experience from previous projects, and data from publically available CDM documentation to indicate costs per tonne, it is possible to estimate a benchmark cost per tonne but thresholds are not set. Thresholds are not set because of the differing challenges, which translate into different costs, of developing CDM projects in different countries utilising differing technologies. For example, the cost per tonne of developing a project in an LDC may be higher than in a middle or lower middle income country. In this instance, a higher cost per tonne avoided may be acceptable if it helps to take the CDM into new territories. Similarly, by investing in projects for which a CDM methodology is not so established, and may require the services of a specialist auditor, the cost per tonne saved by a project may be higher than previously experienced. Again, if this promotes the use of a cutting edge technology which would not have otherwise been funded as a CDM project, the higher cost may be justified as it achieves a policy objective.

Further, the CDM is a flexible, market based mechanism introduced under the Kyoto Protocol which today has only one established compliance market where CERs can be sold, the European Union. Previously, the value for money of a project was also linked to the price of European Union Allowances (EUAs) issued under the EU Emissions Trading Scheme; if the cost per tonne of a proposed project / programme is high and the price of EUAs is high, then a high cost per tonne may be acceptable. However, as the price of EUAs has collapsed, a strong link between EUA prices and generated CERs is difficult to maintain, meaning a key external determinant of value for money has significantly changed.

Finally with respect to the carbon funds, there may be a lending component offered to finance the underlying project. In this case the funds will also check other parameters such as cost per MW and levelised cost as part of their financial and economic analysis, but this is more from a due diligence point of view.

The NCF disburses funding on a milestone basis, and as per its terms and conditions has a right to reduce the final disbursement proportionally if the agreed climate related benefits which were forecasted *ex-ante* are not met.

The German International Climate Change Initiative (IKI) also has a mandate and method of operation which means it assesses value for money without the use of the indicators previously listed in Table 7 . The IKI's typical projects are not renewable energy or energy efficiency projects, but include:

- Support for the development and implementation of ambitious Low Carbon Development Strategies (LCDSs) and Nationally Appropriate Mitigation Actions (NAMAs).

- Capacity building for national MRV experts.
- Support for global carbon markets - development and implementation of regional and national emissions trading systems with MRV and linking them to future-oriented global market mechanisms.

These more policy based operations are assessed for VfM ideally by the setting of SMART indicators. The majority of indicators used are qualitative and assessed based on expert judgement within the IKI.

Table 11 shows a summary of the VfM indicators in use by CDFs. Appendix G Stakeholders' Views on each VfM Indicator

gives a more detailed account of how each indicator is viewed and used by the DBs and CDFs consulted for this study.

Indicator Used to Assess VfM	Use by Climate and Development Funds
Cost per tonne of carbon dioxide saved.	**The GEF** does not have cost per tonne rules, but cost per tonne reduced can be used as a guide. The Secretariat has a rough idea of what cost per tonne should be (based on past experience and expert judgement), and this is usually in the range of a few dollars per tonne to tens of dollars per tonne of carbon dioxide abated. If greater, then a discussion will be had with the proposing agency to see if there have been some gains which have not been included in the business proposal. The GEF Secretariat will also discuss with the proposing agency whether the project can be modified to generate more GHG reductions or other benefits. But even if costs are high, this will not necessarily mean a "red line" is crossed e.g. when supporting projects involving innovative technologies, it is very difficult to assess VfM on a cost per tonne basis.
Cost per megawatt.	Not used to set benchmarks, thresholds or to assess VfM.
Private and public sector finance leveraged.	**The GEF** requires any other financing that is required for the project to proceed is to be substantiated *ex-ante* at the approval stage. This is termed "co-financing". Any financing related to the project that comes about after the release of funds by the GEF is termed "leveraged finance". Leveraged finance in GEF terms is not assessed by the GEF *ex-ante*, but is monitored *ex-post* using their tracking tool (see Section 4). Co-financing, which can be public or private investment, is financing deemed necessary to achieve the project objective and leveraged finance is a by-product. During interview it was highlighted that past experience from the GEF's own pipeline shows the level of co-financing that may be achievable for a given project; e.g. energy efficiency has sub-sectors where the following could be expected (but these are not thresholds which need to be met): • Energy efficiency with respect to appliances and equipment may attract investment ratios of 3-5:1 (i.e. USD3-5 leveraged for every USD1 invested by the GEF). • Energy efficiency projects involving heating systems may attract ratios of 20:1 The NCF scores projects as part of its evaluation procedure and has a very different target for co-investment: 20% of finance for each project should come from other sources. The higher the level of co-investment, the higher the project's score.
Levelised cost of energy by technology.	Not used to set benchmarks, thresholds or to assess VfM.
Cost per	Not used to set benchmarks, thresholds or to assess VfM.

Indicator Used to Assess VfM	Use by Climate and Development Funds
person of access to clean energy.	

Table 11 How Indicators Used to Assess VfM are Employed by CDFs

It should be noted that with respect to “private sector finance leveraged”, respondents to the consultation reported that due to confidentiality of investments, this indicator was very difficult to benchmark externally (i.e. outside of own experience or portfolio).

3.3.4 Summary of Indicators’ Used

The main findings are that DBs providing loans ensure VfM of investments through the use of primary investment indicators and consider indicators which can be used for VfM assessments as secondary investment indicators.

CDFs providing grants, with less emphasis on the requirement to ensure financial returns, are more likely to employ VfM indicators in their decision processes. In Table 12 and Table 13 the findings of the consultation process are summarised highlighting the use of indicators. These tables are colour coded as follows:

- **Entries in red** are used where a DB or CDF does not assess the indicator in question.
- **Entries in yellow** are used when a DB or CDF assesses this indicator but does not use it for VfM assessments or benchmarking is carried out on an informal basis (i.e. used as a “sense check” when evaluating a proposed project).
- **Entries in green** represent a finding of where a DB or CDF assesses an indicator to ensure VfM of investments. In some cases, indicators may be used both as a screen and in order to ensure VfM. For example, the NFC has a target of minimum 20% of project costs to be co-financed as a screen, but also scores projects with a greater amount of co-financing higher in its evaluations.

One key caveat for the use of the following tables is that whilst this is a useful way to represent findings, it should not be assumed that because a parameter is not assessed, that a DB or CDF does not regard VfM as important to its operations. VfM may be assured in other ways, such as through the use of primary investment criteria. In addition, it should be borne in mind that just because a two-dimensional indicator is not monitored, it doesn’t follow that the constituent one-dimensional indicators are not; e.g. in the case of SREP, because “cost of access to clean energy per person” is not monitored, it does not mean “number of people with access to clean energy” and “project cost” are not monitored.

A very limited number of consultees set benchmarks and thresholds around energy efficiency and generation projects. Fewer still have declared VfM benchmarks / targets / guidelines, and these DBs and CDFs do not differentiate between technology types or host country. Expert judgement is applied when considering primary investment criteria in different countries. For example, LCOE is an economic indicator which includes the costs of subsidies in the calculation. In many developing countries, energy prices include subsidies so this needs to be taken into account in the economic analysis.

Data not monitored	Data collected but not used in VfM assessment	Data used to assess VfM

	Cost per tonne of carbon dioxide saved	Cost per megawatt of renewable power installed	Private sector finance leveraged	Public sector finance leveraged	Levelised cost of energy by technology	Cost per person of access to clean energy
AFD (French Development Bank)	Data is analysed as a "sesnse check" but does not rule projects out	Data collected but used for due diligence, not VfM purposes	Data collected but not for VfM purposes	Data collected but not for VfM purposes	Data not monitored	Data not monitored
Asian Development Bank (ADB)	Data not monitored	Data collected but used for due diligence, not VfM purposes	Data is collected for screening projects, but not for VfM purposes	Data collected but not for VfM purposes	Data collected but used for due diligence, not VfM purposes	Data not monitored
European Bank for Reconstruction and Development (EBRD)	Data not monitored	Data collected but used for due diligence, not VfM purposes	Data collected but not for VfM purposes	Data collected but not for VfM purposes	Data is collected for screening projects, but not for VfM purposes	Data not monitored
European Investment Bank (EIB)	Data not monitored	Data collected but used for due diligence, not VfM purposes	Data collected but not for VfM purposes	Data collected but not for VfM purposes	Data is collected for screening projects, but not for VfM purposes	Data not monitored
International Finance Corporation (IFC)	Data not monitored	Data collected but used for due diligence, not VfM purposes	Data collected but not for VfM purposes	Data collected but not for VfM purposes	Data collected but used for due diligence, not VfM purposes	Data not monitored
Inter-American Development Bank (IDB)	Data not monitored	Data collected but used for due diligence, not VfM purposes	Data collected but not for VfM purposes	Data collected but not for VfM purposes	Data not monitored	Data not monitored
KfW (German Development Bank)	Data not monitored	Data collected but used for due diligence, not VfM purposes	Data collected but not for VfM purposes	Data collected but not for VfM purposes	Data not monitored	Data not monitored

Table 12 DBs' Use of Indicators

Data not monitored	Data collected but not used in VfM assessment	Data used to assess VfM

	Cost per tonne of carbon dioxide saved	Cost per megawatt of renewable power installed	Private sector finance leveraged	Public sector finance leveraged	Levelised cost of energy by technology	Cost per person of access to clean energy
Clean Technology Fund (CTF)	Data is collected for screening projects and measure "cost effectiveness"	Data not monitored	Data is collected (key CTF indicator) but not used for VfM purposes	Data is collected (key CTF indicator) but not used for VfM purposes	Data not monitored	Data not monitored
Scaling-up Renewable Energy Programme (SREP)	Data not monitored	Data not monitored	Data is collected (key SREP indicator) but not used for VfM purposes	Data is collected (key SREP indicator) but not used for VfM purposes	Data not monitored	Data not monitored
Carbon Partnership Facility (CPF)	Monitored at the fund level, not used to approve / reject individual projects	Data not monitored	Data not monitored	Data not monitored	Data not monitored	Data not monitored
Community Development Carbon Fund (CDCF)	Monitored at the fund level, not used to approve / reject individual projects	Data not monitored	Data not monitored	Data not monitored	Data not monitored	Data not monitored
Global Environment Facility (GEF)	Data collected for screening projects and VfM purposes	Data collected but used for due diligence, not VfM purposes	Data collected for screening projects and VfM purposes	Data collected for screening projects and VfM purposes	Data collected but used for due diligence, not VfM purposes	Not used
International Climate Initiative (IKI)	Data not monitored	Data not monitored	Data not monitored	Data not monitored	Data not monitored	Data not monitored
Nordic Climate Facility (NCF)	Data is collected for screening projects, but not for VfM purposes	Data collected but used for due diligence, not VfM purposes	Fund has a target around co-investment. Higher levels mean projects score high at evalutaion	Fund has a target around co-investment. Higher levels mean projects score high at evalutaion	Data not monitored	Data not monitored

Table 13 CDFs' Use of Indicators

3.4 Discussion on the Use of Indicators, Benchmarks and Thresholds

3.4.1 Key Messages from Consultation Respondents

This section of the report is comprised of two sub-sections; an examination of each of the nominated VfM indicators and a summary of the key messages received with respect to them. Before examining each indicator in turn, the overall perception towards indicators and their use is discussed.

In addition to providing the key messages below, stakeholders participating in the consultation also asked the following when discussing their own use of value for money indicators:

- How is value for money defined?
- What it is the end use of benchmarks?
- Does ensuring value for money in one outcome lead to a trade-off with another development or climate outcome?

Key messages raised by consultees are summed up below.

There is value in collecting and having access to good quality data with which to compare and benchmark proposed projects' performance

Almost without exception, consultees used previously monitored data and external sources only as a cross-check in their investment decisions. This is primarily due to the fact that whilst some organisations interviewed do have significant experience of investment in clean energy and energy efficiency projects in developing countries, this is still in the main a developing area. In addition, some technologies are new or constantly evolving and hence have (a) limited data with which to benchmark against, even in developed economies, (b) are still developing in terms of price (e.g. concentrated solar power installations) and (c) are implemented in heterogeneous sectors and country conditions.

Consultees did not attempt to benchmark their own costs with others' costs or monitoring and evaluation results due to incomparable methodologies for calculating investment costs. This is because consultees offer different kinds of financial assistance, are channelling finance from different sources and hence have differing costs of capital (this is discussed in Appendix D).

Most consultees responded positively to the idea of being able to expand the pool of data available to assess projects, particularly where the evidence base is thinner in developing countries.

There are concerns over the misuse of benchmark data as focussing on one indicator, instead of a suite of indicators, could lead to perverse incentives and decisions

This was one of the most significant concerns discussed by consultees. The apprehension arises from the possibility that by having data accessible to all with which to benchmark and set thresholds, that the investment decision process may:

- Become overly-simplified, i.e. just focusing on one indicator when the overall investment question involves considering a group of indicators.

- Lead to investment decisions that are targeted because they meet expected benchmark values, but this could "crowd out" broader transformational projects which (for example) do not fall within a usually accepted cost range.

There are concerns as to the methodologies and evidence bases used to derive benchmarks

There are a number of ways to collect, report and compare data. A key concern for consultees was that if this was not carried out in a consistent manner, benchmarks could lead to results opposite to what was intended during their compilation. For example, the cost of capital and the definition of baselines varies from CDF to CDF, DB to DB; meaning that comparing like for like is difficult when looking beyond one's own portfolio.

This is not surprising given that there is for example no internationally recognised standard for the calculation of a more "mature" indicator such as FIRR, which has been used in project finance calculations and projections for decades. In the computation of FIRR, there can be many variables between analyses, such as:

- Including or excluding corporate income tax.
- Including or excluding interest during construction from capital expenditure (CAPEX).
- Including or excluding value added tax from CAPEX and sales prices.
- Inclusion or not and value of revenue from carbon finance.

In some cases, the selection of projects may not be in the hands of funding bodies

Strategic projects may be implemented even if not providing the best value for money if part of a government's strategy in a region or sector. Or, projects proposed as part of a programme of activities could be pre-determined to a certain degree.

It should not be assumed that access to funding is limited for all. Under general circumstances, DBs relatively have easier access to new capital if needed

Unlike investment funds with a finite limit of capital, DBs typically do not have an absolute limit on their level of capitalisation. DBs have the option to go back to capital markets and borrow more if suitable projects are found which were not originally budgeted for. Hence, there is less of a need for DBs to assess projects against each other (please see the next key message). The more projects they can invest in that pass screening and primary investment criteria, the better.

It's not necessarily about choosing between projects, each project decision is based on the project's own merits

In considering benchmarking, there can be a tendency to believe that DB or CDF decision makers have a group of projects and pick the best from the set; in reality it is a "yes" / "no" decision on each project based on absolute merits.

If not managed properly, a focus on VfM could lead to" crowding" out of the private sector

If the investment community seek to invest only in projects that provide VfM, there may be a risk that projects which could have been funded by the private sector are given donor / concessional rate capital. This would therefore lead to "crowding out" the private sector and inhibiting the development of markets.

Technical rather than financial benchmarks have proven more useful to date

Work on two-dimensional indicators which combine (e.g.) both cost and technical performance in one indicator needs further development. Meanwhile, the EBRD has successfully implemented the use of technical benchmarks to approve loans in several Sustainable Energy Financing Facilities. This is explained in detail in Appendix I.

Benchmarks can quickly go out of date and maintaining them can be resource intensive

Performance standards and the costs of technologies are changing over time. This is particularly true of newer, more innovative and emerging technologies. Hence, benchmarks need to be revised on a regular basis to ensure their validity. This can be a costly and / or very resource intensive process.

3.5 Evidence Base for Indicators Used in VfM Assessments

Indicators in use today are mainly used to ensure screening and primary investment criteria and not to assess VfM. Hence, the evidence base around which to screen projects and prove commercial, economic and social viability is also more developed than it is for VfM assessments

3.5.1 Evidence Base Used for the Screening Process

It is important to note that in this growing area of investment, the threshold values that are used to enforce screening criteria to approve / reject project applications, or to trigger enhanced reporting requirements, are not generally based upon extensive studies or published guidelines. They may be based on brief studies. However, the most common source of evidence is the expert judgement provided by investment teams and specialist consultants. DBs and CDFs will also employ the use of specialist consultants to assist with project assessment if needed. An OECD study also found that in developing countries, the availability of reliable information, notably statistics, are often of too poor a level of quality to make reliable assessments. There is a lack of precedence in investing in research or looking at cost effectiveness in public spending. Hence, few comparators, indicators and ways of creating proxies exist[(10)]. Furthermore, threshold values and their application in the screening process are not adapted depending on country or technology context. For example:

- With respect to carbon foot printing the EIB says that, “Not all projects need to [report their] GHG footprint and only projects with significant emissions are to be assessed. Based on the results of the first six months of the GHG footprint pilot in 2009 it was decided to set minimum project thresholds for inclusion in the GHG footprint exercise as follows:

  - Absolute emissions greater than 100ktCO_2-e
  - Relative emissions (either positive or negative) greater than 20ktCO_2-e”

  This level was found to capture approximately 95% of absolute and relative emissions from EIB projects[(11)]. The evidence base used is the same regardless of project type or location (according to EIB investment guidelines).

- The IDB in its Environment and Safeguards Compliance Policy[12] requires all projects, including renewable energy and energy efficiency projects to report upon gross and net emissions when they are considered "significant". However, there is no definition of "significant" in that policy document. In the bank's own sustainability report, it reports on "projects with emissions, or emissions savings, exceeding 25 ktCO_2e per annum". Emissions over 25ktCO_2e are considered significant based on experience and this value does not vary by sector or project host country.
- In line with its general approach to cost-benefit analysis, the EIB will in general require that an energy efficiency project demonstrates that the benefit of the project (in terms of energy saved) outweighs the costs. For projects with multiple objectives, it is necessary to demonstrate that EE savings represent a significant element of the project (e.g. >50%)[13].

In general, the evidence upon which decisions are made, even in mature markets such as Europe, is largely based on the experience of engineers, specialist consultants and past projects. The ADB for example maintains data on project costs in an internal document "Cost Data of ADB Power Projects", a cross-check against (e.g.) IEA data is a secondary action. A summary of indicator values which could be used as a cross-check for investment costs is presented in Appendix G Stakeholders' Views on each VfM Indicator

to this report. When investing in developing countries, an even more pragmatic approach and even higher levels of trust in experts is required. No consultee was able to nominate an external database where data in order to benchmark on a country by country, sector by sector basis was available.

The use of sectoral experts, taking a pragmatic approach where necessary is also the case in the UK. The Department of Energy and Climate Change regularly updates a summary of the levelised costs of generating electricity in the UK, this is based on a model developed by expert consultants (Mott MacDonald)[14].

3.5.2 Evidence Base Used to Satisfy Investment Criteria

A key reason as to why VfM assessments may happen or not is due to the availability or otherwise of data to make such assessments. In the case of some indicators, they are required to be demonstrated as per the DB's or CDF's investment guidelines (screening and primary investment indicators to meet primary investment criteria). Hence, project proponents will prepare evidence and even design projects to show that the investor's primary investment criteria have been satisfied. However, where there is no requirement to provide such data by an investor, a project proponent will not collect this data. This means that in general, as the data is not part of the primary decision, it is not collected as a matter of course and hence not available neither for studies such as this, nor even to the investor unless specially requested.

The evidence base around VfM considerations is therefore today not so strong and robust, and relies heavily upon a pragmatic approach being taken by experts.

3.6 Benchmarking from a Project Developer's Viewpoint

The experience of a project developer, MWH Global, is provided in Annex I to exemplify how energy efficiency standards are employed by a DB (the EBRD), in conjunction with a CDF (the CTF), in order to promote best available technology (BAT) use. The EBRD uses benchmarks developed by the project developer in for example Turkey[15], Romania[16] and Belarus[17]. The case of Turkey is discussed in Annex I.

SECTION 4

Benchmarking: Literature Review

- A key finding is that whilst there is a lot of information in the literature with respect to overall development effectiveness, VfM is not nearly as well documented. It is concluded that this is due to the fact that the majority of the key players who would benchmark such indicators to ensure VfM, are currently doing so in a limited way. Where assessment of VfM is taking place, non-standardised approaches are used.
- Some raw data with which to benchmark projects is available, but readily prepared data in order to use in benchmarking exercises is not ubiquitous. It is found that as the need for, methodology and use of benchmarks is linked to mandate as discussed in Section 3, it is difficult for (e.g.) academic institutions and industry experts to provide comprehensive benchmark data beyond technical performance data or costs. Available data often has a question about the methodology used to collect and process it, particularly with respect to costs. Two-dimensional indicators, i.e. combining costs and technical parameters, are the rarest kind of indicator found.

4.1 Overview
The review of existing thresholds used to benchmark international climate projects by DBs and CDFs was supplemented by desk based analysis of publically available information. This included guidelines, tools and other documents published by consultation participants for screening and investment decisions. It also included other literature relevant to benchmarking and VfM published by entities not part of the study's consultation process.

In summarising the evidence, example data sets available for benchmarking renewables and energy efficiency costs / performance have been captured. These are presented along with caveats for their use.

4.2 Guidelines Used for Screening and Investment Decisions

Guidelines have been developed by most DBs and CDFs to screen climate related investments, with varying levels of detail on the required performance and environmental characteristics of proposed projects. It should be noted that they are not always applied across the whole investment portfolio

In this section, guidance prepared by DBs and CDFs which explains how they will assess projects submitted for funding is summarised. This guidance is both for internal use and also to inform potential applicants. All of the DBs and CDFs contacted as part of the stakeholder consultation provided information on their investment and decision making processes; the level of detail on internal process varied significantly however.

As noted earlier, DBs place a greater emphasis on the economic and financial feasibility of their projects. As a result they attach a greater weight to economy and efficiency to justify their investments. Many have produced guidance notes and documents on the internal procedures and calculation methodologies they employ. DBs' 'appraisal manuals', which not only highlight the economic and financial assessments, are used in conjunction with social and environmental safeguards, and technical appraisal methodologies.

Economic and financial assessments are not as high a priority for CDFs offering grants as DBs offering loans, thus less guidance was identified for CDFs in this regard. However, because they are typically offering grants and focus more on effectiveness than economy and efficiency, it does not follow that they disregard the financial and economic aspects of projects. Also, as the CTF, SREP and GEF disburse funds through intermediary organisations (often DBs); they can also make use of the financial and economic assessment skills and experience of those organisations in this regard.

The Evaluation Cooperation Group (ECG) have developed and implemented a number of Good Practice Standards (GPS)[(18)] which have been adopted by a number of the DBs and CDFs consulted (e.g. the GEF). The goal of documenting these standards is to harmonise evaluation practice among ECG members and improve understanding of evaluation practices. Derived from the evaluation principles of the OECD–DAC, these GPSs were built on good evaluation practices, and were designed to be consistent with the DBs' operational policies. The ECG has developed standards for both public[(19)] and private[(20)] sector organisations.

In terms of best practice, and as examples only, the EIB and IFC's guidelines are highlighted here.

The EIB has produced a particularly transparent and clear document titled 'The Economic Appraisal of Investment Projects'[(21)]. It provides a detailed breakdown of the financial and economic appraisals adopted by the bank; summarises the criteria used in defining the counterfactual scenarios across the various methodologies used, namely Cost Benefit Analysis (CBA), Cost Effectiveness (CEA), Multi Criteria Analysis (MCA) and the approach to integrating environmental externalities into the project appraisals. The document goes on to breakdown the assessment methodologies used at sector level, providing case studies and the methodologies used with real examples. Finally, this document is most progressive in its methodology to calculate baseline emissions from electricity systems, introducing concepts such as "Operating Margin" (catalogues operating plants that will be taken offline if a renewable project is implemented) and "Build Margin" (catalogue of yet to be built plants which would be built in the business as usual scenario).

The IFC has produced a global guidance document for investment and advisory staff to conduct GHG emission reductions calculations for climate-related projects. The guidance document includes methodologies for calculating baseline emissions, project emissions and emission reductions from a range of project types[(22)].

4.3 Tools Used for Screening and Investment Decisions

Tools have been developed by most DBs and CDFs to evaluate climate related investments, though no specific VfM tools were identified. A number of different tools are used in-house by DBs and CDFs to assess the GHG impact of climate change. There is increasing convergence of the outputs of different DBs' and CDFs' carbon foot printing methodologies

As outlined in Section 3, the DBs and CDFs consulted do in some instances use indicators for VfM but this is not a common practice. Hence, no 'VfM specific' tools were identified as part of the review. Other tools are used by DBs and CDFs to screen and assess projects to ensure suitability for investment however.

The GEF uses a project review sheet[(23)] to ensure proposed projects meet the fund's investment criteria. The GEF's review sheet collates information related to project eligibility, resources availability, comparative advantage of the Implementing Agency, project milestones, confirmation that correct documentation has been submitted, project results, project financing details and more. The GEF's tracking tool[24] is used to monitor project results and compare them to initial targets. Further, the GEF has also introduced methodologies for estimating GHG emission reductions from energy efficiency[25] and transport[26] related projects.

The IFC has produced a number of tools of interest in this area, such as the:

- Development Outcome Tracking System (DOTS)[27], used to measure the effectiveness of its investments and advisory services. The combination of these three tools shows the IFC to be a particularly innovative DB in the study.
- Carbon Emissions Estimator Tool (CEET)[28] for estimating project GHG emissions; this tool builds upon a tool developed by Agence Française de Développement (AFD) and expanded to cover IFC investment sectors. The CEET provides investment departments with a simple way to estimate actual project emissions based on information commonly collected during project appraisals, as well as enabling the calculation of changes in GHG emissions by comparing project emissions to an alternate project, or reference, scenario.
- Climate Assessment for Financial Intermediary Investment (CAFI)[29], is a web-based application which enables financial intermediary clients to monitor results for both investment and advisory projects in the areas of energy efficiency, renewable energy, and climate adaptation. This is of particular interest as much funding in the investment community is passed on through intermediaries, so communicating and monitoring the originators requirements is a way to ensure compliance and effectiveness.

The CTF[30] and IDB[31] are also good examples of a CDF and DB that have developed advanced tracking tools and frameworks to monitor results.

Whist tracking tools are found to be quite bespoke, commonality was found between tools used by DBs and CDFs in GHG reporting. Each DB and CDF has developed their own GHG reporting tools and templates in order to calculate and track emissions from their investments in line with their internal processes[32], [33], [34]. The different methodologies used by DBs and CDFs can make GHG comparison of projects difficult as scope and coverage of GHG emissions vary. However, although many DBs have their own methodology for GHG accounting, there has been an attempt to harmonise these approaches. The "International Financial Institution Framework for a Harmonised Approach to Greenhouse Gas Accounting" [35] is such an attempt but is at this stage a work in progress. The methodology is now used by a number of international financial institutions[36].

4.4 Other Literature of Interest for the Study

One key finding from the literature review is that whilst there is information in the literature about development effectiveness at the fund or portfolio level, VfM is not documented nearly as well. As per the consultation findings, this is not to say VfM is not important for the DBs and CDFs. Instead, in cases where VfM guidelines do not exist, VfM is often ensured through other methods (e.g. primary investment criteria).

Self-evaluation is an important task for many DBs and CDFs in order to keep in line with their mandates and objectives. Two detailed examples were identified during the literature review; one on the CTF and the other by the GEF.

- The CTF have undertaken an investigation across thematic areas, in an attempt to evaluate its processes. The areas include: relevance; efficacy; efficiency, financial additionality, and leverage; sustainability; CIF governance and management;

administrative efficiency; national planning and consultation processes; monitoring and evaluation; and safeguard mechanisms. The CIF have published an interim report with their findings which found that “Guidance on how to calculate cost-effectiveness is not clear and does not yield a value with comparative meaning.”[(37)]

- The GEF has undertaken a detailed review of the impact from their completed emissions mitigations projects in four larger emerging markets: China, India, Mexico and Russia. Eighteen projects were reviewed in total, in order to determine: the contributions to GHG emission reduction and avoidance; the progress made by the supported activities towards transforming markets for climate change mitigation; and the impact pathways and factors affecting further progress towards market transformation[(38)]. One particular conclusion of interest was Conclusion #5 which states that whilst there is a good quality methodology in existence for *ex-ante* estimations of emission reductions, for *ex-post* “the methodology to measure GHG emissions and to calculate emission reductions at project completion is not robust and contains uncertainties”.

4.5 Data for Benchmarking in the Literature

As the need, methodology and use of benchmarks is linked to mandate as discussed in Section 3, it is difficult for (e.g.) academic institutions and industry experts to provide comprehensive benchmark data beyond technical performance data or costs

As part of the literature review, useful benchmarking data for renewable energy and energy efficiency was identified. This information has been pooled from a number of sources, including:

1. Energy Sector management assistance program (ESMAP)
2. International Renewable Energy Agency (IRENA)
3. European Bank for Reconstruction and Development (EBRD)
4. US Energy Information Administration
5. Energy Regulators Regional Association (ERRA)
6. European Wind Energy Association (EWEA)
7. European University Institute
8. US Department of Energy (US DoE)
9. Renewable Energy Policy Network for the 21st Century (REN21)
10. International Atomic Energy Agency (IAEA)
11. National Renewable Energy Laboratory (NREL)
12. Energy Regulators Regional Association (ERRA)
13. United Nations Industrial Development Organisation (UNIDO)
14. International Energy Agency (IEA)
15. McKinsey & Company (McKinsey)

As an example “access to energy” and associated cost data has been compiled by ESMAP[(39)] and SE4ALL[(40)]. The former has undertaken a report on monitoring the performance of electric utilities, and indicators and benchmarks in Sub-Saharan Africa. The latter developed a new framework for tracking progress toward the goal of “Sustainable Energy for All”.

In the following sections 4.5.1 – 4.5.4, sample data is presented for levelised costs of concentrated solar power (CSP) and on-shore wind projects which are of particular interest to the UK ICF. Also, expected savings from a range of energy efficiency measures / technologies and the specific energy consumption of energy intensive products is shown.

Finally, abatement cost curves are discussed but found to be not so transparent. The levelised costs presented by IRENA are very specific and give four indicators in relation to each technology. Expected energy savings from standards (Section 4.5.3) provide detailed technical data but not costs. Finally GHG abatement cost curves are criticised by some for being a “black box” of numbers whose collation and development is not so transparent (please see section 4.6). Hence, there is a range of usefulness which is associated with the data shown in the following sections. Please refer to Appendix B for a summary of the data available.

4.5.1 Levelised Costs of Concentrated Solar Power (IRENA)[41]

<table>
<tr><th></th><th>Installed cost (2010 USD/kW)</th><th>Capacity factor (%)</th><th>O&M (2010 USD/kWh)</th><th>LCOE * (2010 USD/kWh)</th></tr>
<tr><td colspan="3">Parabolic trough</td><td rowspan="7">0.02 to 0.035</td><td rowspan="3">0.14 to 0.36</td></tr>
<tr><td>No storage</td><td>4,600</td><td>20 to 25</td></tr>
<tr><td>6 hours storage</td><td>7,100 to 9,800</td><td>40 to 53</td></tr>
<tr><td colspan="3">Solar tower</td><td rowspan="3">0.17 to 0.29</td></tr>
<tr><td>6 to 7.5 hours storage</td><td>6,300 to 7,500</td><td>40 to 45</td></tr>
<tr><td>12 to 15 hours storage</td><td>9,000 to 10,500</td><td>65 to 80</td></tr>
</table>

* The levelised cost of electricity (LCOE) assumes a 10% cost of capital

- Concentrating solar power (CSP) plants are capital intensive, but have virtually zero fuel costs. Parabolic trough plants without thermal energy storage have capital costs as low as USD 4 600/kW, but low capacity factors of between 0.2 and 0.25.
- Operations and maintenance (O&M) costs are relatively high for CSP plants, in the range USD 0.02 to USD 0.035/kWh.
- The levelised cost of electricity (LCOE) from CSP plants is currently high. Assuming the cost of capital is 10%, the LCOE of parabolic trough plants today is in the range USD 0.20 to USD 0.36/kWh and that of solar towers between USD 0.17 and USD 0.29/kWh.
- With just 1.9 GW of installed CSP capacity, not enough data exists to identify a robust learning curve.
- However, the opportunities for cost reductions for CSP plant are good given that the commercial deployment of CSP is in its infancy. Capital cost reductions of 10% to 15% and modest reductions in O&M costs by 2015 could see the LCOE of parabolic trough plants decline to between USD 0.18 and USD 0.32/kWh by 2015 and that of solar tower plants to between USD 0.15 to USD 0.24/kWh.

It should be noted that neither IRENA documents (referenced for CSP or on-shore wind) are country specific. The IEA does provide some limited country specific data (please see Appendix H). Country specific data where more than one indicator is presented is however quite rare.

4.5.2 Levelised Costs of On-Shore Power (IRENA)[42]

	Installed cost (2010 USD/kW)	Capacity factor (%)	O&M (2010 USD/kWh)	LCOE * (2010 USD/kWh)
Onshore				
China/India	1,300 to 1,450	20 to 30	Not available	0.06 to 0.11
Europe	1,850 to 2,100	25 to 35	0.013 to 0.025	0.08 to 0.14
North America	2,000 to 2,200	30 to 45	0.005 to 0.015	0.07 to 0.11

	Installed cost (2010 USD/kW)	Capacity factor (%)	O&M (2010 USD/kWh)	LCOE * (2010 USD/kWh)
Offshore				
Europe	4,000 to 4,500	40 to 50	0.027 to 0.048	0.14 to 0.19

* The levelised cost of electricity (LCOE) assumes a 10% cost of capital

- Installed costs in 2010 for onshore wind farms were as low as USD 1 300 to USD 1 400/kW in China and Denmark, but typically ranged between USD 1 800/kW and USD 2 200/kW in most other major markets.
- Operations and maintenance costs (O&M) can account for between 11% and 30% of an onshore wind projects levelised cost of electricity (LCOE).
- The levelised cost of electricity from wind varies depending on the wind resource and project costs, but at good wind sites can be very competitive.

4.5.3 Expected Savings from a Sample of Energy Saving Measures

In Table 14 , a sample of energy efficiency standards along with expected performance standards are presented. It should be noted that whilst these are these are not country specific, they can be employed globally however local contextualisation is advised (e.g. expected savings may change in tropical operating environments or colder climates). Energy efficiency standards have been used to set thresholds (e.g. by the EBRD, see Section 3.6), however standards are more often used for informal benchmarking in decisions.

System Type	Technology	Sub-technology type	Performance standard and reference
Building system	Building insulation	Fiberglass insulation material	• Fiberglass, thermal conductivity ≤ 0.045 W/Mk • CE, EN 13162: 2001 - EN13171:2001
Building system	Building insulation	Rockwool insulation material	• Rockwool, thermal conductivity ≤ 0.040 W/mK • CE, EN 13162: 2001 - EN13171:2001
Compressed air system	Air compressor	Screw air compressor	• Specific consumption ≤ 115 Wh/N3
Compressed air system	Air compressor	Centrifugal air compressor	• Specific consumption ≤ 115 Wh/N3
Energy Supply (electricity and thermal)	PV Solar	Mono / Polycrystalline PV panels	• Electric efficiency ≥ 12% • Performance tests based on TS EN 61215, TS EN 61646 and TS EN 62108
Energy Supply (electricity and thermal)	PV Solar	Thin film	• Electric efficiency ≥ 10% • Performance tests based on TS EN 61215, TS EN 61646 and TS EN 62108
HVAC&R System	Chiller	Electric package chiller screw type	• Package Electric chiller (air-cooled type) Coefficient of Performance (COP) ≥ 2.6
HVAC&R System	Chiller	Electric package chiller scroll type	• Package Electric chiller (air-cooled type) Coefficient of Performance (COP) ≥ 2.6

Table 14 Estimated Energy Savings from a Range of Measures

Table 15 lists the status of energy consumption in major industries, along with the existing best available practice benchmarks. It should be noted that data on a country level is not available.

Sector or Process	Best Available Practice Benchmarks
Iron and steel	Practical minimum energy consumption for a blast furnace is 10.4 GJ/t iron.
Cement	Dry-process kilns thermal energy consumption: 2.9–3.3 GJ/t clinker. Dry-process kilns electricity consumption: 95–100 kWh/t cement.
Chemicals and petrochemicals	Olefin production from steam cracking: 12 GJ/t olefin (excluding feed stocks). Ammonia production from natural gas: 11 GJ/t ammonia (excluding feed stocks). Methanol production from natural gas: 9 GJ/t methanol (excluding feed stocks).
Aluminium	Total fuel and electricity consumption of Bayer process: 9.5–10 GJ/t alumina. The current best practice of Hall–Heroult electrolysis cells (using currents of 300–315 kA) is estimated at 12.9–13 MWh/t aluminium.
Pulp and Paper	Mechanical pulping 7.5 GJ elec/t. Chemical pulping 12.5 GJ/t + 2.08 GJ elec/t. Waste paper pulp 0.5GJ/t + 0.36 GJ elec/t. De-inked waste paper pulp 2.0 GJ/t + 1.6 GJ elec/t. Depending on final paper quality energy intensities vary from 3.7 –5.3 GJ/t + 1.8–3.6 GJ elec/t.

note: GJ/adt = gigajoule/air dry ton pulp; kA = kilo ampere; kWh = kilowatt-hour; MWh/t = megawatt-hour/ton

Table 15 Energy Consumption from a Range of Energy Intensive Industries

4.5.5. GHG Abatement Cost Curves[42]

McKinsey & Company (McKinsey) have developed an integrated fact base and related cost curves showing the significance and cost of each available approach, globally and by region and sector. As the baseline for the study, McKinsey used the "business-as-usual" projections for emissions growth from the International Energy Agency (IEA) and the US Environmental Protection Agency (EPA). They then analysed the significance and cost of each available method of reducing, or "abating," emissions relative to these business-as-usual projections. The study covers power generation, manufacturing industry (with a focus on steel and cement), transportation, residential and commercial buildings, forestry, and agriculture and waste disposal, in six regions: North America, Western Europe, Eastern Europe (including Russia), other developed countries, China, and other developing nations. It spans three time horizons—2010, 2020, and 2030—and focuses on abatement measures that it is estimated would cost equal to or less than EUR40 per tonne of CO_2 abated in 2030.

The cost curves developed show estimates of the prospective annual abatement cost in euros per tonne of avoided emissions of greenhouse gases, as well as the abatement potential of these approaches in gigatons of emissions. The abatement cost for wind power, for example, should be understood as the additional cost of producing electricity with this zero-emission technology instead of the cheaper fossil fuel-based power production it would replace. The abatement potential of wind power is an estimate of the feasible volume of emissions it could eliminate at a cost of 40 euros a tonne or less. Looked at another way, these costs can be understood as the price—ultimately, to the global economy—of making any approach to abatement cost competitive or otherwise viable through policy decisions. A wide range of assumptions about the future cost and feasible deployment rates of available abatement measures underlie the estimates of their cost and significance.

4.6 Caveats for Using Data and Limitations of Literature Available

The datasets identified will provide a useful reference data set for the UK ICF; however they will have to be used with an element of caution. For example:

- Due to differences in collation and calculation methodologies employed between sources, data is unlikely to be comparable.
- Information available, e.g. baseline emission factors, are not always country or sector specific.
- Many sources use a ‘snapshot’ of prices at a particular time. With prices changing, the data can quickly go out of date (particularly for emerging renewables such as CSP).
- Indicators and benchmarks need to be looked at in conjunction with other related data, rather than focussing on the individual indicators. Used in isolation, an unintended simplification of the decision process may occur.

The importance of clarity when reporting on emissions, is shown to be imperative, as climate change professionals can launch “devastating attacks” on institutions such as that on the World Resources Institute when distinctions between gross and net emissions were not made clear.[(44)]

Transparency of calculating and reporting emission reductions and their cost was an issue further highlighted by Greenpeace in their 2011 report “Bad Influence – how McKinsey-inspired plans lead to rainforest destruction”[(46)]. This assessed McKinsey’s REDD cost curve, concluding that McKinsey must “immediately publish all the data, assumptions and analysis underlying the international and national versions of its cost curve and include such disclosures in all future publications”. Benoît Bosquet, Coordinator of the Forest Carbon Partnership Facility (FCPF) at the World Bank in 2011 also stated at the time that “the [McKinsey REDD cost curve] ‘black box’ is a problem for everybody”.

SECTION 5

Conclusions and Next Steps

- There was universal agreement amongst stakeholder participants that more reliable and robust data would be welcomed to inform decision making. Whilst a complex technical challenge, it is the latest in a series of other measures that were once thought too difficult to implement.
- The next proposed steps are to: (1) Build a useful and robust database that can be used to set benchmarks in clean energy and energy efficiency projects (2) Win the confidence of the investment community by engaging more closely on this topic in a workshop environment (3) Take steps to expand the scope and coverage of the data which can be used for benchmarking.
- In moving forward, the first target should be to improve the available data so that benchmarking can be carried out in a more informed manner. Thresholds to establish VfM should be regarded as a step further which can be taken once confidence is won in a database of cost and other performance data.

5.1 Current use of Indicators by DBs and CDFs

The study's methodology has captured the conceptual and real world views on indicators. It has given a summary of indicators used in DB's and CDFs' investment processes, and the criteria used for investment decisions. The main conclusions from the analysis are as follows:

There are two main types of indicators that are used for benchmarking and setting thresholds: one-dimensional indicators and two-dimensional indicators

One-dimensional indicators have been used in investments and project management for decades; e.g. estimates of cost of projects, installed capacity of proposed projects, number of people with access to clean energy as a result of a project etc. Two-dimensional indicators allow for the combination of one-dimensional indicators to assess (e.g.) performance for a given cost with one indicator.

Indicators are used by DBs and CDFs to screen project proposals, and to check that they meet certain investment criteria

Projects are firstly screened by DBs and CDFs to rule out those which are not in line with their goals or mandate. After screening, there are two levels of investment criteria. Primary investment criteria are used to ensure the financial, economic and risk of projects are in line with investors' expectations with respect to required returns on investment. Secondary investment criteria are used in order to refine the investment decision; after first stage screening and primary investment criteria show *whether* a proposed project is in line with goals and expectations, secondary investment criteria can show *how well* investments meet expectations.

All DBs and CDFs strive to ensure VfM, this being defined as a combination of the economy, efficiency and effectiveness of investments. The respective weightings

applied to each of those three considerations depends on the type of financial support offered

When DBs and CDFs are providing loans (typically but not exclusively development banks), they do not use "VfM indicators" such cost per tonne of carbon dioxide avoided, cost per megawatt installed, private / public sector financed leveraged, levelised cost of energy or cost of access to clean energy to assess VfM . It is concluded that this is because after their screening criteria have been passed and their primary investment criteria thresholds have been met, there are no requirements in their guidelines to use such indicators.

DBs and CDFs providing grants to the public sector (typically but not exclusively climate and development funds) have been found to use "VfM indicators" to show conformance to screening criteria and in some cases for benchmarking for VfM. It can be concluded that this is because it is explicitly part of their mandate and in their investment guidelines, and as there is no requirement to make a financial return on investments funded by grants, VfM indicators can be used to evaluate projects instead of financial indicators. However, it needs to be emphasised that it would be incorrect to conclude that when CDFs provide grants that they do not evaluate economy and efficiency in their investment decisions.

However, the use of "VfM indicators" is generally a secondary investment consideration, after it has been demonstrated that a project is financially, economically and technically possible, while in-line with an investor's mandate

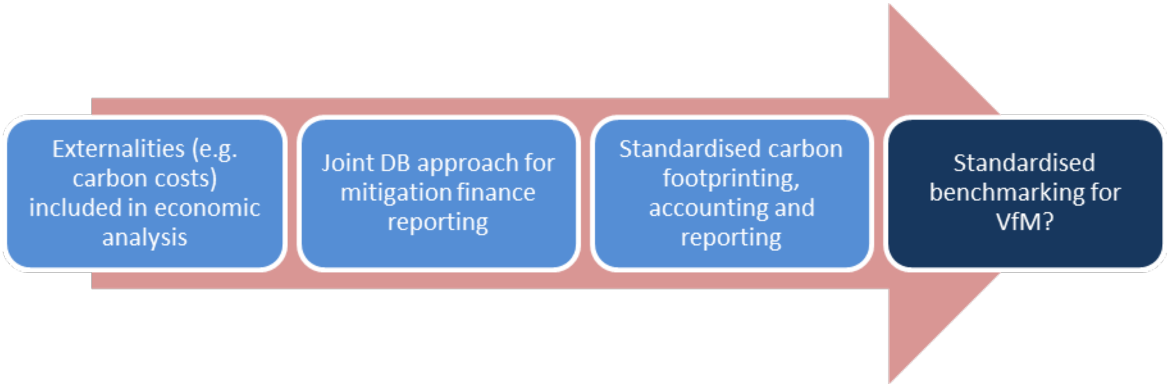
VfM indicators are mainly used by DBs and CDFs as a "sense check" when making an investment decision. A high cost per tonne of carbon dioxide avoided or high cost per megawatt per unit of installed generation equipment will not immediately rule a project out of consideration for funding. Instead of being a "red line" crossed, an indicator which is out of line with expected values will instead trigger further investigation by a DB or CDF to understand why, hence it could be considered more as a "red flag". For example, a high cost per megawatt might be justified if plant load factor is high or if the power selling price from a renewable project is high.

There was universal agreement amongst stakeholder participants that more reliable and robust data would be welcomed so as to inform decision making. Whilst a complex technical challenge, it comes after a series of other measures which were once considered too difficult to implement, such as incorporating the costs of externalities in investment decisions

Benchmarking to ensure VfM is happening today. Whilst only some DBs and CDFs have it as an explicit part of their mandate, others (e.g. development banks) have it "built in" to their everyday investment decisions as part of their completion of primary investment assessments. It is however an internally focussed process with DBs and CDFs looking at their own portfolios and own staff for comparisons. In part, this is due to concerns about the quality of benchmark data acquired from other sources.

There was though, universal agreement that access to more data that can be trusted would be beneficial to all, if used correctly. However, many stakeholders have doubts that this is possible due to methodological, confidentiality and cost considerations. Consider the timeline in Figure 4**.** It gives an idea of progress made in the provision of targeted climate finance (shown in lighter blue). Some, like the incorporation of externalities into economic analysis (e.g. the cost of carbon), or using standardised methods for accounting for GHG emissions were thought equally impossible by some not many years back. Today these are happening and it is hoped that benchmarking to ensure VfM is one of the next steps to aid and assist the flow of targeted investments into projects that deliver the best outcomes for the capital invested.

Figure 4 Development of Tools and Processes to Better Inform Investment Decisions



Just because indictors exist, it does not follow that benchmarks exist. Furthermore, because indicators and benchmarks exist, it need not follow that thresholds are, or should, be put in place

In terms of developing future benchmarks the target should be to gather data to establish benchmarks which are useful for the investor in their own work. Once this is shown to be a robust process, attention can be directed to how to set thresholds. This should be a second step.

Furthermore, measures should be put in place to stop benchmarks inadvertently becoming thresholds. The danger is that someone conducting a project review, *ex-ante* or *ex-post* may determine a project to be poor VfM because it did not reach a benchmark level of performance cost. How this may be achieved merits further investigation.

5.2 Next Steps

The next proposed steps are to:

1) Build a useful and robust dataset that can be used to set benchmarks in clean energy and energy efficiency projects. This would initially take place in a small sample of countries and technology types.
2) Win the confidence of the investment community by engaging more closely on this topic in a workshop environment.
3) Take steps to expand the scope and coverage of the data which can be used for benchmarking.

5.2.1 Building a Robust Dataset to Start a Process

The investment, baseline and methodological details of 6,191 renewable energy projects, 577 supply side energy efficiency projects and 292 demand side CDM energy efficiency projects were available at the time of writing.[47]

Whilst the geographical distribution of projects is not even, there certainly exists the possibility to at least start a database of parameters which can provide accurate, twice audited data which is obtained using standardised methodologies. Standardised methods of representing projects are achieved for example by:

- Methodologies for renewable power and energy efficiency which have strict eligibility for use criteria.
- Standard methodologies for determining counterfactual scenarios.
- Standard tools to calculate emission factors of electricity systems.
- Guidelines to calculate market penetration of technologies.

- Guidelines on demonstrating first of its kind.

Similarly, there is country specific data for energy efficiency measures (minimum equipment performance standards, estimates of energy input per unit of production in different sectors etc.) which are not easily and quickly accessible today. These could also be compiled into a series of reference benchmarks. Such standards would need to be gathered in co-operation with governments and technology providers as part of the next steps in this study.

5.2.2 Winning the Confidence of the Donor and Investment Community

There are many preconceptions about benchmarking and VfM which need to be overcome:

- Users could rule a project out based on one indicator value rather than looking at the bigger picture.
- By focusing on VfM, only the “cheapest”, “easiest” and close to commercially viable projects will be funded.

A workshop scenario could provide the opportunity for the benefits of benchmarking (as described by DfID(48)) to be reinforced and discussed:

- VfM is about maximising the impact of each pound spent to improve poor people’s lives.
- The purpose of the VfM drive is to develop a better understanding (and better articulation) of costs and results so that one can make more informed, evidence-based choices. This is a process of continuous improvement.
- VfM doesn’t mean only the cheapest projects proceed, but investors need to improve their understanding of what is driving costs and ensure that they are getting the desired quality at the lowest price. Where investors work through partners, DfID wishes to influence them to do the same.
- DBs and CDFs need to understand what works - a judgement based on the strength of evidence supporting an instrument and making assumptions explicit.
- Investors don’t just wish to implement the easiest projects to measure, but rather endeavour to become better at measuring. Investors should strive to be more innovative in how they assess value and they need to get better at articulating what results are achieved with public money. Where donors work through partners, they should influence them to do the same.
- Partner countries play a critical role in delivering results. For this reason
- One partner can support other partner countries to lead their own development.

Once focussed on the benefits, the barriers to benchmarking for VfM can be openly discussed, as can potential solutions to methodological concerns and caveats for their use.

5.2.3 Expanding the Scope and Coverage of the Dataset.

Following the establishment of an early stage robust and useful database, winning confidence in that database and its use is the next step. If it can be demonstrated that it is of use, the possibility of pooling “standardised” data from other sources (e.g. DBs and CDFs) that can be used for benchmarking should be pursued. There is an opportunity to work with co-operative donors and investors with whom the ICF is already working with to:

- Look back at previous projects and retrieve standardised data where possible.
- Establish standardised data collection procedures such that projects currently under consideration and approaching application stage can provide useful data in future.

Reflecting on the fact that benchmarks are time-bound, it should be emphasised that gathering data for benchmarking purposes is a continual process. If conducted in a standardised and accepted way, the collection of data for benchmarking will surely assist in the assessment of VfM and serve to better achieve climate change and development goals.

5.3 Main messages from the stakeholder consultation

Following consultation with investment professionals, some key messages have been received:

- It is seen that there is value in benchmarking for VfM, e.g. increasing transparency so as to encourage government funding of CDFs and DBs).
- It is felt that the potential risks (e.g. potential over-simplification of the investment decision) mean that benchmarking for VfM could outweigh the benefits overall.
- Benchmarking is an internal process, with DB and CDF decision makers assessing proposed projects against their own past projects and experience of expert teams.
- Decision makers may cross-check values against third party information (e.g. from the IEA), but not against others' reported results. This is because methodologies for collecting and reporting costs, performance and results are not standardised.
- Differing mandates means a different prioritisation of investments and hence the value placed on capital invested.
- Barriers to benchmarking for VfM outside of a decision maker's own institution include:
    - Lack of standardised investment procedures makes comparing like for like difficult.
    - Each DB or CDF, even the more mature ones consulted, have limited numbers of projects in developing countries with which to benchmark proposed projects against.
    - A perception that maximising VfM may mean more expensive projects (e.g. technologies in new markets) proposed in more challenging environments may be neglected, or that the private sector is "crowded out".
    - Finding "good" projects (i.e. likely to be built to plan, operated correctly etc.) is not so easy and so DBs / CDFs cannot afford to be too selective in their project selection once the major tests (screening, primary investment criteria) are passed.
    - Today, development banks are trying to increase the size of their portfolios; the idea of ruling projects out based on VfM could be contrary to this ambition.

Due to the above, the use of "VfM indicators" is currently a secondary investment consideration, after it has been demonstrated that a project is financially, economically and technically possible and in-line with an investor's mandate. However, VfM can help both donors and borrowers to develop projects more in line with their goals. Given the clear benefits of benchmarking to ensure VfM if carried out in a considered manner, the question then becomes:

How can "VfM indicators" be moved from the category of secondary investment criteria to become primary investment criteria?

Appendix A Specific Research Questions Answered

This study has sought to answer key questions with respect to the use of benchmarks and thresholds. These are now presented along with answers below.

1. What are the benchmarks and thresholds for investment decisions used by existing multilateral and national development banks for climate projects in developing countries?

"VfM indicators" are employed by some climate and development funds:

- The CTF specifies that proposed projects and programmes should not ordinarily be funded if the marginal abatement cost per tonne of carbon dioxide is greater than USD200/tonne. This limit is set in order to rule out the possibility of funding projects which employ technology still at the research and development phase. Further, project proponents are also required to provide an estimate of the cost effectiveness of investments by estimating the cost of each tonne of carbon dioxide avoided as a result of CTF investment. However, at the time of writing, the CTF Trust Fund Committee acknowledged that these requirements were not being implemented in project proponents' applications for funding.

- The GEF does not have an explicit cost per tonne of carbon dioxide threshold but from past experience understands the range in which proposed projects' cost per tonne avoided should fall. If considered too high, the GEF team will engage in dialogue with a project proponent to ensure that all potential carbon savings have been incorporated into the proposed project. If after this the cost per tonne is considered too high, a request for funding may be rejected.

- The NCF employs a screen which states that projects should have a significant climate component, i.e. the global benefits of GHG emission reduction or carbon sequestration should be at least 10% of project investment costs.

- The CTF, GEF and NCF all have it within their remit to only invest in projects if there is co-investment from other parties, either public or private. This could be to only fund incremental costs, or to ensure project partners have a stake in their project and are incentivised for success. Hence, all three monitor the amount of co-investment proposed in a project application, encourage it, and are aware of roughly how much should be received for a given project type. However, only the NCF sets a target on this. When capitalised after the last call for funds, the NFC was set a minimum target of 20% co-financing of projects. This threshold was set mainly to secure sufficient co-ownership in the latest call but still support innovative projects with limited access to financing (also based on experience from previous calls). Projects with higher amounts of co-investment score more highly at evaluation than projects with lower levels of co-investment.

- The IFC guidelines state that energy efficiency projects must reduce total energy consumption by at least 15%.

- In line with its general approach to cost-benefit analysis, the EIB will in general require that an energy efficiency project demonstrates that the benefit of the project (in terms of energy saved) outweighs the costs. For projects with multiple objectives, it is necessary to demonstrate that EE savings represent a significant element of the project (e.g. >50%).

2. ***What thresholds are considered important to demonstrate commercial viability for different technologies and over different timeframes in different countries?***

(a) Financial benchmarks and thresholds ensure that a project can generate enough revenue so that it can cover the capital and operational investment costs, pay pack loans, taxes etc. Investors may require that the financial returns of a project are commensurate to cover the cost of the loan, i.e. FIRR > WACC. As DBs can offer loans at concessional and highly concessional rates, a project proponent's WACC is lower than if capital was obtained at commercial rates.

(b) Risk assessments ensure that investors can have confidence the project will be implemented as planned with respect to (e.g.) the technology, counterparty and host country in question. Risk assessments are a mix of quantitative and qualitative analysis. Thresholds, if in existence, are bespoke and depend on the CDF or DB in question (its risk appetite, cost of capital etc.). An example of a quantitative threshold would be sovereign risk ratings which are publically available.

In conclusion, the most common reason for collecting data was to ensure that projects made sense from a financial, economic and technical point of view (i.e. for due diligence) and this has the potential to be developed into a set of procedures to measure and ensure VfM.

3. ***What thresholds are considered important to demonstrate economic and wider social viability for different technologies and timeframes in different countries?***

Economic benchmarks and thresholds ensure that the as well as the financial aspects of projects, the costs and benefits of externalities to wider society are captured. Investors often require that with respect to economic analysis, the net present value of an investment is greater than zero. Similarly, they may require ERR to be above a certain threshold. Only one institution specifies an actual figure for ERR, the Asian Development Bank specifies that project ERR > 10% should be met for a project to be considered for investment. This was originally published in the institution's 1993 document *Guidelines for the Economic Analysis of Projects.* This rate has been applied to all projects, not just clean energy and energy efficiency projects for over twenty years now and this indicates its use is to rule out projects with a borderline / debatable net positive economic effect.

The EIB states that for a mature renewable power plant to be deemed economically viable, it must have an LCOE equal to or lower than the baseline alternative, including a shadow price for carbon emissions, adjusting for any differences in expected output profile between technologies.

During the course of consultation and desk review, it was found that as investments into innovative technologies based in countries with immature markets is a relatively new area. Hence, differentiated investment procedures depending on technology type or host country were extremely limited. For example, the IDB has categorised borrowing countries into four categories, and only small and vulnerable countries are entitled to grants.

4. ***To what extent are these thresholds based on robust evidence? Is this evidence available or has a pragmatic approach been taken?***

In the vast majority of cases, the evidence base used was:

- Previous findings from projects completed in the DB / CDF in question's own portfolio.
- Expert judgement used by DB and CDF decision makers.
- Specialist consultants engaged for particular project types where internal expertise required supplementing.

Data is cross-checked against third party sources, but this is very much a secondary activity.

5. *How should these benchmarks and thresholds be interpreted given differentiated nature of projects, sectors, types of finance and countries?*

Benchmarks and thresholds used to ensure VfM are not extensively used, and there is little or no differentiation between project types and / or countries when they are. Expected rates of return are adjusted dependent on finance type due to sources of funding that DBs and CDFs can access, and countries have different risk profiles / levels of penetration of technologies and hence be treated differently. How they are treated differently is not always explicit or publically described, save for examples like the IDB mentioned above.

6. *With further research and engagement with international funds and project teams, is there the scope to develop this work further to address evidence gaps and develop suitable thresholds (ranges where appropriate) for different countries, sectors and interventions; is there adequate empirical data to back up these estimates?*

One of the key barriers to benchmarking is the limited availability of a sample set upon which to carry out benchmarking. The CDM project pipeline contains much publically available information which can be accessed and used. Similarly, whilst not employed by consultation participants extensively in this study, national and region specific energy efficiency related standards are available.

7. *What evidence is available to develop key indicators/benchmarks and suitable thresholds in priority country/regions and sectors? (i.e. alternative indicators to existing benchmarks already identified)*

The investment, baseline and methodological details of 6,191 renewable energy projects, 577 supply side energy efficiency projects and 292 demand side CDM energy efficiency projects were available at the time of writing.[(49)]

Whilst the geographical distribution of projects is not even, there certainly exists the possibility to at least start a database of parameters which can provide accurate, twice audited data which is obtained using standardised methodologies. Standardised methods of representing projects are achieved for example by:

- Methodologies for renewable power and energy efficiency which have strict eligibility for use criteria.
- Standard methodologies for determining counterfactual scenarios.
- Standard tools to calculate emission factors of electricity systems.
- Guidelines to calculate market penetration of technologies.
- Guidelines on demonstrating first of its kind.

In addition, some stakeholder consultation participants offered to share some data on a confidential basis. As DBs' and CDFs' own portfolios are generally not so large, it is through further engagement with willing consultation participants that a robust database of indicator, benchmark and threshold values can be built.

Similarly, there is some country specific data for energy efficiency measures (minimum equipment performance standards, estimates of energy input per unit of production in different sectors etc.) and these could also be compiled into a series of reference benchmarks.

Appendix B Primary Evidence Gathering Methodology

A key component of the 'Benchmarking: Building the Evidence Base to Maximise Value for Money for ICF Projects' project is the consultation with key stakeholders. These were a selection of development banks (DBs) and climate development funds (CDFs). The proposed methodology for this part of the study is as follows:

Preparation

1. Identification of relevant individuals from the list or organisations set out in the project terms of reference. These individuals are likely to deal with project appraisal, benchmarking and evaluation as part of their role.
2. Phone introduction. The project manager will contact the relevant individuals to introduce the project and gauge interest in participation. A follow-up interview will be scheduled.
3. Where individuals request, a short-list of interview questions can be emailed to them in advance of the interview
4. Based on desk-research around the organisation, a longer-list of interview questions will be tailored to reflect the approach to appraisal, benchmarking etc. that is taken. This will allow for this information to be easily referenced during the interview.
5. Where it has been possible to identify the use of certain benchmarks for different technologies/countries/timescales, a relevant data pro forma will be completed by the interviewer in advance of the interview.

Interview

1. Interviews were conducted by telephone. The interviewers will have access to supplementary information on best practice and technology specific benchmarking during the call so that relevant information can be given to the interviewee where necessary. The interviewers will also have the fund/bank-specific desk-based research available for reference.

Follow up

2. The interviewee will be asked to check/complete/add to the data pro forma with the identified benchmark information in, and return this via email. This should be followed up by the interviewer within 1 week if not received.
3. It is possible that not all the questions in the interview scheduled will get covered during the call, either due to a lack of time or because the interviewee has to check certain details. If this is the case, selected questions can be sent to the interviewee by email for written responses. These should be followed up by the interviewer within 1 week if not received.
4. Information on best practice and technology specific benchmarking can also be sent to interviewees via email following the interview should they require further examples or background information in order to provide their responses.

Appendix C Benchmarks and Thresholds Using the Same Indicator

The table below shows how the same indicator value, cost per kW installed, can be considered as a benchmark or threshold. Depending on the policy of the decision maker, a project's application for funding may therefore be approved or rejected based on the same data.

Indicator Value	Indicator Use	Scenario A	Scenario B	Scenario C
1300-1450 USD/kWe	As a benchmark	Proposed project costs 1200USD/kWe. **Outcome:** Proposed project passes this test and goes on for analysis	Proposed project costs 1400USD/kWe. **Outcome:** Proposed project passes this test and goes on for analysis	Proposed project costs 1600USD/kWe. **Outcome:** Proposed project is investigated further to see if other aspects of the project justify higher investment costs. E.g. if the project has a comparatively high plant load factor, if it leads to other significant development outcomes such as above average job creation or is quantitatively / qualitatively judged to be transformational, then the project may still receive investment.
1300-1450 USD/kWe	As a threshold	Proposed project costs 1200USD/kWe. **Outcome:** Proposed project passes this test and goes on for analysis	Proposed project costs 1400USD/kWe. **Outcome:** Proposed project passes this test and goes on for analysis	Proposed project costs 1600USD/kWe. **Outcome**: Proposed project is rejected on the grounds that its investment costs are too high compared to the threshold value.

Appendix D Consultation Respondents

In order to understand the current use of benchmarking in clean and energy efficiency projects, a consultation with key DBs and CDFs was carried out. Participants were interviewed by telephone and follow up email exchange where required (please see Annex E for full details). Participants in the study are listed and described below:

A. Multilateral and National Development Banks:

- AFD (French Development Agency).
- Asian Development Bank (ADB).
- European Investment Bank (EIB).
- European Bank for Reconstruction and Development (EBRD).
- International Finance Corporation (IFC).
- Inter-American Development Bank (IDB).
- KfW (German) Development Bank – Climate Change Competence Centre.

DBs, like commercial banks exist in order to maximise shareholder value. However, there are three main differences between commercial and development banks; their multilateral shareholding structure and preferred creditor status, and a subsidised capital base and access to other subsidies.[(50)] Where commercial banks' shareholder value is in the form of a paid dividend, governments, which are typically the shareholders of DBs see value as the delivery of defined development outcomes.

DBs have a range of targeted development outcomes which are summarised in Section 3.2 and below. However, it can be summarised that essentially, the main objective of a development bank is:

"To achieve climate / development goals through making appropriate investments in projects which provide a return on investment, commensurate to the cost of their own operational expenditure."

To break this statement down:

- "Climate / Development goals" vary (e.g. job creation, market transformation, decarbonisation etc.). Goals should be achieved if a project is implemented as described during the application for funding stage.
- "Appropriate investments" can be thought of in two ways:
  - Appropriate in that they achieve development goals; banks have a range of screening criteria, tools and guidelines in place which aim to ensure this.
  - Appropriate in that the risk that the project carries (counterparty, country, technology etc.) should be correctly assessed and be in line with the Bank's risk appetite.
- Returns on investment can be thought of in two ways:
  - Financial return ensures that a project is commercially viable; i.e. that it can service loans, pay taxes, operation and maintenance costs.
  - Economic returns account for the benefits and costs of projects to wider society which are not captured by financial analysis.
- Operational expenditure breaks down into day to day running costs and, more importantly, the cost of their own borrowing. The latter is a key consideration, sources of capital include:
  - **Shareholder contributions** shareholders are usually donor and recipient government.

- **Capital markets**. The DBs typically borrow funds on international capital markets at interest rates significantly below those at which international commercial banks borrow, (i.e. London Interbank Offered Rate (LIBOR)), but marginally above the risk free interest rates at which their most creditworthy shareholders raise funds(51).
- **Pooled financing arrangements** such as climate specific financial intermediary funds (e.g. the GEF, CIFs) or targeted investment vehicles such as the Global Climate Partnership Fund (GCPF)(52).

Given that the cost of capital from capital markets is variable (e.g. the Asian Development bank can borrow from the Asian Development Fund at concessional rates or on the conventional capital markets), the financial return required by a DB will also be variable. However, due to being blended with the other sources of funds listed above, market volatility should not be felt as severely as in commercial banks and by commercial borrowers. To the borrower from a DB, the cost of capital (if indeed capital is requested, it is not in the case of a guarantee) depends on the type of instrument.

Using the EIB as an example, one can see the range of financial products available:

- **Project loans** for large developments in excess of EUR 25m.
- **Intermediated loans** are made via local banks.
- **Structured finance** provides additional support to priority projects.
- **Guarantees**: helping projects attract new investors.
- **Project bonds**: unlocking infrastructure funding.
- **Equity & fund investment** to catalyse further activity.
- **Venture capital**: for investment in high-tech and growth small and medium enterprises (SMEs).
- **Microfinance** for relatively smaller investments.

This raises a fundamental question about VfM; is value determined by the cost at which capital is borrowed, or the amount of output / outcome that can be realised per unit of capital spent? For the purposes of this report, the latter definition is used. DBs and their mandates are reasonably similar in that they broadly share the share the same objective of achieving their development / climate change goals whilst covering their costs. That said, the range of financial products and instruments they offer varies greatly; they will administer grants on behalf of funds, they will offer highly concessional loans and loans at just below commercial rates but on preferential terms. Ensuring VfM of a bank guarantee is primarily a question regarding due diligence of the implementing organisation, whereas ensuring VfM of a project will look at the project activity more closely. Hence, for ease of comparison, this report will assume that when discussing DBs, this will be limited to loans and concessional loans.

Looking at VfM from the point of view of cost of capital, it was suggested by the EIB during consultation that donors should focus on projects with a high EIRR. Where FIRR is low / negative and risky, grants are the most suitable instrument. Where FIRR is approaching WACC and where risks are low, DBs and commercial players will support projects. Hence VfM – where best to use public funds – becomes a discussion about EIRR, FIRR and risk.

B. Multilateral and Bilateral Climate / Development Funds (CDFs):

- Clean Investment Funds (CIFs):
  - Clean Technology Fund (CTF).
  - Scaling-up Renewable Energy Programme (SREP).
- Community Development Carbon Fund (CDCF).
- Carbon Partnership Facility (CPF).

- International Climate Initiative (IKI).
- Global Environment Facility (GEF).
- Nordic Climate Facility (NCF).

CDFs are an altogether more heterogeneous sample set relative to DBs. For example, they could have been established under the UNFCCC (i.e. The GEF), outside the UNFCCC (e.g. the CIFs) or be set up by nations / groups of nations (e.g. IKI / NCF). Depending on mandate and type of investment, they may or may not require returns on investments. This is because in addition to grants and concessional funding, they also engage in private sector finance like DBs do. However, as private finance is channelled through DBs in most cases, CDFs take advantage of the processes DBs have in place. Hence, CDFs are considered in this report with respect to their public sector financing operations. When providing private sector finance, they may employ the primary investment criteria guidelines of the DBs through whom they disburse funds, but that is beyond the scope of this report. Finally, some CDFs have a goal which is focused on mitigation (e.g. emission reductions or deploying clean technology. Others may look beyond mitigation. The NCF's project mix is approximately 50% mitigation / 50% adaptation for example.

C. Other Contributors

In addition, input from project staff at the following organisations consistently provided a positive backup for the results obtained, but their organisations did not take part in the consultation:

- International Renewable Energy Agency (IRENA).
- Energy Sector Management Assistance Programme (ESMAP).
- Regional Technical Assistance Programme (RTAP).
- Sustainable Energy for All (SE4ALL) programme.

Appendix E Goals of Different Financial Institutions

Institution/ Fund Name	Mandate
Clean Technology Fund (CTF)[52,53,54] Primary mandate – climate change mitigation Primary instrument – grant	The CTF (administered by the World Bank which is also a Trustee) provides middle income countries with resources to explore options to scale up the demonstration, deployment, and transfer of low-carbon, clean technologies. It focusses on high abatement opportunities at the country level. Each investment plan is tailored by the country to be integrated into national development objectives and to serve as a programmatic organising framework for the activities of actors across institutions, stakeholder groups, and sectors. The World Bank Group, the African Development Bank, the Asian Development Bank, the European Development Bank, and the Inter-American Development Bank are the implementing agencies for CTF investments. The key objectives of the CTF are: (a) Providing positive incentives for the demonstration of low carbon development and mitigation of GHG emissions through public and private sector investments; (b) Promoting scaled-up deployment, diffusion and transfer of clean technologies by funding low carbon programs and projects that are embedded in national plans and strategies to accelerate their implementation; (c) Promoting realisation of environmental and social co-benefits thus demonstrating the potential for low-carbon technologies to contribute to sustainable development and the achievement of the Millennium Development Goals; (d) Promoting international cooperation on climate change and supporting agreement on the future of the climate change regime; (e) Utilising skills and capabilities of the DBs to raise and deliver new and additional resources, including official and concessional funding, at significant scale; and (f) Providing experience and lessons in responding to the challenge of climate change through learning-by-doing. The key indicators by which the CTF measures its overall success are: • Tonnes of GHG emissions reduced or avoided. • Volume of direct finance leveraged through CTF funding – disaggregated by public and private finance. • Installed capacity (MW) as a result of CTF investments. • Number of additional passengers (disaggregated by men and women if feasible) using low carbon public transport as a result of CIF investment. • Annual energy savings as a result of CTF investments (GWh). It should be noted that "as project level output/intermediate indicators are specific to each project/program and the priorities of each country that this represents, it is proposed that they are not specified by the CTF results framework. However, project/program documentation will demonstrate how the output indicators that are selected will help achieve outcomes at the CTF program (country) level."[56] The CTF is not required to provide / demand a financial return on investment in public sector projects. However, as per (a) above, the CTF does make private sector investments and hence requires a level of financial safeguarding of investments (described below).

Institution/ Fund Name	Mandate
	Accessing the CTF by countries and private investors is achieved through partnering with a DB.
Scaling-up Renewable Energy Programme (SREP)(57) Primary mandate – climate change mitigation Primary instrument – grant	The aim of the SREP is to pilot and demonstrate, as a response to the challenges of climate change, the economic, social and environmental viability of low carbon development pathways in the energy sector by creating new economic opportunities and increasing energy access through the use of renewable energy. The programme aims to: (a) Have a transformative impact by supporting low carbon development pathways by reducing energy poverty and/or increasing energy security. This is measured using national measures of “energy poverty” such as the Multi-Dimensional Poverty Index or some equivalent mutually agreed measure. (b) Have an outcome of increased supply of renewable energy. (c) Have an outcome of increased access to modern energy services. The SREP is not required to provide / demand a financial return on investment in projects.
Global Environment Facility (GEF) (57,58,59) Primary mandate – climate change mitigation (focused on in this study) Primary instrument – grant	The GEF aims to help developing countries and economies in transition to contribute to the overall objective of the United Nations Framework Convention on Climate Change (UNFCCC) to both mitigate and adapt to climate change, while enabling sustainable economic development. The GEF is intended to cover the incremental costs of a measure to address climate change relative to a business as usual base line. Unlike the CTF which focuses on high GHG abatement opportunities, the GEF has six focal areas: climate change, land climate change, biodiversity, land degradation, international waters, ozone depletion, and persistent organic pollutants. The GEF also has six strategic elements, re-stated at the fifth replenishment of funding: (a) (Continuing to act as) a key operating entity of the financial mechanism of the major global environmental conventions by providing assistance to a large number of countries through a comprehensive approach employing investment, technical assistance and scientific assessment, and by embodying an integrated approach that links different conventions and focal areas; (b) Functioning as the coordinator and/or manager of several funds, building on the track record of managing funds entrusted to the GEF by the United Nations Framework Convention on Climate Change (UNFCCC); (c) Pioneering combinations of grant and non-grant instruments to support investments of a transformative scale; (d) Maintaining focus on innovation, catalysing supporting of cutting-edge technologies and policy reforms with the objective of enabling replication and scaling-up; (e) Enhancing engagement with the private sector, building upon advances made in GEF-4 through the Earth Fund; and (f) Refining focal area strategies to reflect the emerging scientific and policy understandings. The policy recommendations of the Third Replenishment of the GEF Trust Fund, endorsed by the GEF Council in October 2002, requested “the GEF Secretariat to work with the Council to establish a system for allocating scarce GEF resources within and among focal areas with a view towards maximising

Institution/ Fund Name	Mandate
	the impact of these resources on global environmental improvements and promoting sound environmental policies and practices worldwide." Furthermore, the policy recommendations stated that, "the system should establish a framework for allocation to global environmental priorities and to countries based on performance. Such a system would provide for varied levels and types of support to countries based on transparent assessments of those elements of country capacity, policies and practices most applicable to successful implementation of GEF projects. This system should ensure that all member countries could be informed as to how allocation decisions are made."(61) The System for Transparent Allocation of Resources was therefore conceived which provides detailed guidance on the allocation of resources to countries and calculates the GEF Benefits Index for a number of areas, including climate change projects. This is discussed further in Section 4. It should be noted that accessing the GEF funding is via accredited agencies. At the time of writing there were ten such agencies including DBs, FAO, IFAD, UNDP, UNEP, UNIDO and the World Bank. Like the CTF, the GEF does also have interactions with the private sector; again these are administered by the accredited agencies. With respect to the GEF (and CTF), grants to the public sector are focussed on in this study.
Community Development Carbon Fund (CDCF) Primary mandate – climate change mitigation Primary instrument – purchase of generated emission reduction credits	The CDCF supports projects that combine community development attributes with emission reductions to create "development plus carbon" credits, and will significantly improve the lives of the poor and their local environment.(62) The key metric for the CDCF is the volume of carbon credits generated in the fund's target sectors. A unique factor to bear in mind with carbon funds is that aside from some relatively minor development costs (e.g. project design document (PDD) development, Designated Operational Entity (DOE) and CDM registration costs), these funds pay upon results. Hence, in addition to the fact that third party auditors thoroughly examine all projects before the CDM Secretariat does, their view on value for money is particularly different to other DBs and CDFs analysed in this report
Carbon Partnership Facility (CPF) Primary mandate – climate change mitigation Primary instrument – purchase of generated emission reduction credits	The CPF's objective is to develop emission reductions and support their purchase on a large scale through the provision of carbon finance to long-term investments. In order to scale up carbon finance, the CPF will collaborate with governments and market participants on investment programs and sector-based investments that are consistent with low-carbon economic growth and the sustainable development priorities of developing countries.(63) The key metric for the CDCF is the volume of carbon credits generated in the fund's target sectors. A unique factor to bear in mind with carbon funds is that aside from some relatively minor development costs (e.g. project design document (PDD) development, Designated Operational Entity (DOE) and CDM registration costs), these funds pay upon results. Hence, in addition to the fact that third party auditors thoroughly examine all projects before the CDM Secretariat does, their view on value for money is particularly different to other DBs and CDFs analysed in this report.

Institution/ Fund Name	Mandate
International Climate Initiative (IKI) [64] Primary mandate – climate change mitigation Primary instrument – grants	The IKI finances climate projects in developing and newly industrialised countries, as well as countries in transition economies. The IKI focuses on promoting a climate-friendly economy and measures for climate change adaptation and for the preservation or sustainable use of carbon reservoirs/Reducing Emissions from Deforestation and Forest Degradation (REDD). With respect to their mitigation activities: • Support for the development and implementation of ambitious Low Carbon Development Strategies (LCDSs) and nationally appropriate mitigation actions (NAMAs which have demonstrable MRV plans; • Capacity building for national MRV experts, among other things to draw up national greenhouse gas emission inventories along with inventory reports, and establishment of national MRV systems and institutions; • Support for a comprehensive expansion of renewable energies, energy and resource efficiency and climate-friendly transport including policy advice and capacity building; • Support for the global carbon market: development and implementation of regional and national emissions trading systems with MRV and linking them to future-oriented global market mechanisms; and • Mechanisms to mobilise the financial market and private investments and the promotion of sustainable business models for mitigation actions.
European Investment Bank (EIB) Primary mandate – development Primary instrument – loans	The EIB requires that all the projects it is financing are acceptable in environmental and social terms by applying appropriate safeguards to all its operations. The Bank also finances projects that contribute directly to environmental sustainability and social well-being in support of sustainable development, by virtue of their positive contribution either to the protection and enhancement of the natural or built environment and/or to the promotion of sustainable communities.[65] The EIB has a climate action lending target of 25% of its overall lending per annum.[66] As with other DBs, the main objective is achieving bank goals while making a return on investment to cover lending costs (please see Appendix D and Appendix E Goals of Different Financial Institutions
European Bank for Reconstruction and Development (EBRD) [65] Primary mandate – development Primary instrument – loans	E). The European Bank for Reconstruction and Development was established following the fall of the Berlin Wall and given a mandate to foster the transition to a market economy by investing primarily in private sector projects. The Bank is driven by its core environmental mandate of a transition to a low carbon economy. The EBRD support climate change mitigation and adaptation, in particular by investing in energy efficiency and renewable energy projects. The Bank developed its “Environmental and Social Policy” was adopted in 2008. It covers the bank’s commitment of mainstreaming environmental and social considerations into all its activities. The Bank has also outlined Environmental Procedures Guidance to meet the commitments set out in the Environment and Social policy. As with other DBs, the main objective is achieving bank goals while making a return on investment to cover lending costs (please see Appendix D and Appendix E Goals of Different Financial Institutions

Institution/ Fund Name	Mandate
	)
International Finance Corporation (IFC) (68) Primary mandate – development Primary instrument – loans	The IFC works in over 100 developing countries, and allows companies and financial institutions in emerging markets to create jobs, generate tax revenues, improve corporate governance and environmental performance, and contribute to their local communities. IFC's goals, by FY15, are that climate finance reaches 20% of long-term annual commitments and 10% of short-term commitments, representing a total climate business target for IFC's own account of over USD3 billion. In support of its ambitious climate finance targets, IFC has also committed to grow its climate-related advisory activities to 25% of total spend, a total of USD61.4 million in FY15. (69)
Asian Development Bank (ADB) Primary mandate – development Primary instrument – loans	The ADB aims for an Asia / Pacific region free from poverty(70). In terms on sustainability, it has a target of USD 2 billion per year to fund Clean Energy Investments. As with other DBs, the main objective is achieving bank goals while making a return on investment to cover lending costs (please see Appendix D and Appendix E Goals of Different Financial Institutions)
Inter-American Development Bank (IDB) Primary mandate – development Primary instrument – loans	The IDB supports efforts by Latin America and the Caribbean countries to reduce poverty and inequality. The Bank's aim is to bring about development in a sustainable, climate-friendly way.(70) It has a target of 25% of total Bank lending to support climate change initiatives, sustainable energy (including renewable), and environmental sustainability. As with other DBs, the main objective is achieving bank goals while making a return on investment to cover lending costs (please see Appendix D and Appendix E Goals of Different Financial Institutions)
KfW (German) Development Bank Primary mandate – development Primary instrument	On behalf of the Federal Government, KfW Development Bank administers Germany's official Financial Cooperation in more than 100 developing and transition countries in Africa, Asia, South and Central America, the Middle East and the Caucasus. Its priority areas of activity include poverty reduction and economic development, good governance, education and health care, and protection of the climate and the environment. In this way the bank helps the Federal Government achieve its developmental goals(71). It has a climate change/environmental related investment target of 30% of all investment (based on financial flows) for the whole bank group; and 50% of all development investment (based on financial flows), should be climate change or environment related investment As with other DBs, the main objective is achieving bank goals while making a return on investment to cover lending costs (please see Appendix D and Appendix E Goals of Different Financial Institutions)

Institution/ Fund Name	Mandate
AFD (French) Development Agency Primary mandate – development Primary instrument – loans – loans	The AFD is a DB and the main implementing agency for France's official development assistance to developing countries and overseas territories. The agency has committed to annual climate-related funding for the period 2012-2016 as follows: • 50 per cent of AFD's foreign-aid funding (70% of funding in the Asia and Latin America regions should be climate related, 50% in the Mediterranean region and 30% in Sub-Saharan Africa.) • 30 per cent of Proparco's foreign-aid funding (Proparco is the subsidiary working with the private sector). Besides, all projects financed by AFD Group directly (excluding budget support, financial intermediation and capacity building) that have a significant and quantifiable impact in terms of greenhouse gas emissions (increase or decrease) are required to undergo an *ex ante* analysis of their carbon footprint. As with other DBs, the main objective is achieving bank goals while making a return on investment to cover lending costs. Nevertheless, it uses a wide range of products, from sectoral budget support to market conditions tools, including a range of soft loan instruments as well as grants in order to support countries and build their capacities (please see Appendix D and Appendix E Goals of Different Financial Institutions
Nordic Climate Facility (NCF) Primary mandate – climate and development Primary instrument – grants	The NCF finances projects that have a potential to combat climate change and reduce poverty in low-income countries. The Facility is financed by the Nordic Development Fund (NDF) and administrated by NEFCO. The NCF's project mix is approximately 50% mitigation / 50% adaptation.

Appendix F Screening Criteria used by DBs and CDFs

Institution/ Fund Name	Screening criteria
Clean Technology Fund (CTF) [72,73,74,75]	A project's cost per tonne of carbon dioxide reduced is submitted with all project / programme proposals during the application process as a measure of cost-effectiveness. CTF investment guidelines state that projects with a marginal abatement cost of USD200/tCO_2 should not ordinarily be funded, in order to ensure cost-effectiveness of investments. The rationale for this threshold was that according to the International Energy Agency's Energy Technology Perspectives 2008 Report, USD200/ t$CO_2$is the lower-end estimate of the incentive needed to achieve the objectives of the "BLUE Map Scenario". In this way, the mandate of the fund is protected as technologies still in the design stage (which therefore have a higher cost per tonne abatement cost) are ruled out of contention for funding. Investment plans for the public sector, and the proposed pipeline of projects and programs seeking funding under the CTF, will be assessed and prioritised on the basis of Clean Technology Fund "*Investment Criteria For Public Sector Operations":* a) Potential GHG Emissions Savings (paragraphs 8-10). b) Cost-Effectiveness (paragraph 11 and where relevant paragraph 12). c) Demonstration Potential at Scale (paragraphs 13-17). d) Development Impact (paragraphs 18-21). e) Implementation Potential: (paragraph 24). f) Additional Costs and Risk Premium: (paragraphs 28-29). □ The CTF also has within its mandate a requirement to engage with the private sector. According to CTF Private Sector Operations Guidelines[77], in addition to the principles above, the DBs, through which all CTF proposals are submitted must demonstrate in their application for funds should ensure: a) Financial Sustainability b) Effective Utilisation of Concessional Finance c) Mitigation of Market Distortions d) Implementation Risks are Described
Scaling-up Renewable Energy Programme (SREP)[78]	A country eligible for participating in SREP programs should be: 1. A low income country eligible for DB concessional financing (i.e., International Development Assistance (IDA) or a regional development bank's equivalent); and, 2. Engaged in an active DB country program. For this purpose, an "active" program means where a DB has a lending program and/or on-going policy dialogue with the country. SREP should: a) Provide financing for renewable energy generation and use of energy using proven "new" renewable energy technologies. For purposes of SREP, new renewable energy technologies include solar, wind, bioenergy, and geothermal, as well as hydropower with capacities normally not to exceed 10 MW per facility. b) Support complementary technical assistance as this is essential for transformative and enduring change and country engagement and ownership. This could include support for planning and pre-investment studies, policy development, legal and regulatory reform, business development and capacity building (including for knowledge management and monitoring and evaluation) as an integral and complementary part of renewable energy investment operations.

Institution/ Fund Name	Screening criteria
Global Environment Facility (GEF)	Projects requesting GEF funding undergo an initial assessment by the GEF Secretariat, to ensure the proposal is in line with the fund's six mitigation sectors: renewable energy; energy efficiency; sustainable transport; and management of land use, land-use change, and forestry (LULUCF). Proposals are then circulated to the GEF Agencies for review if necessary. Once technically cleared, projects are either submitted to the GEF council or to the CEO for approval (depending on the grant amount requested). Successful applications (at this stage) will be sent for Scientific & Technical Advisory Panel (STAP) screening. [79] The GEF has an internal reference for the cost per tonne carbon dioxide; however a figure has not been formally set. Projects with "too high" a cost, will be rejected (no reference to what figure is "too high"). Furthermore, the GEF only provides funding for the incremental cost of a project, for example: if the baseline scenario is a USD 2m coal plant and the proposed project is a USD 6m wind power project, the GEF will provide up to USD 4m of funding. As the original USD2m always needs to be provided the GEF is always co-financing projects and it monitors amount co-invested.
Community Development Carbon Fund (CDCF)	Projects are selected for their ability not only to meet all primary portfolio and project selection criteria but also for the financial credibility of the sponsors, which must have a proven track record and economic depth[80]. Detailed methodologies are available for all project types that can be registered under carbon crediting mechanisms (most notably the CDM). Hence projects can have their eligibility criteria assessed against these.
Carbon Partnership Facility (CPF)	Projects must meet the fund objectives, in order to be considered for funding. Projects must: [81] • Be consistent with the sustainable development objectives, relevant sector policy and climate change strategy, if any, of the host country; • Be expected to have a demonstration or scaling-up impact and to make a contribution to lowering greenhouse gas emissions or limiting their growth in the relevant geographic region or sector; • For the First Tranche: comply with the Portfolio and Program Selection Criteria; and for the other Tranches, comply with the Portfolio and Program Selection Criteria of the relevant Tranche or other requirements as they may be determined from time to time by the Trustee of the Carbon Fund in consultation with Buyer Participants and Eligible Participants for that Tranche; and • Comply with the World Bank Operational Policies and Procedures and support the Bank's Country Assistance Strategy in Borrowing Member Countries. Detailed methodologies are available for all project types that can be registered under carbon crediting mechanisms (most notably the CDM). Hence projects can have their eligibility criteria assessed against these.
International Climate Initiative (IKI)	Projects must be relevant to one or several of the IKI's key focus areas for mitigation as described in Appendix E Goals of Different Financial Institutions Projects should be innovative in character (technologically, economically, methodologically, and institutionally), integrated into national strategies, and contribute to national economic and social development. The effects of a project must also be sustainable.[82]

Institution/ Fund Name	Screening criteria
	Other criteria for project evaluation and selection include: • Duplicability of results, prominence and multiplier effect. • Transferability of projects to the level of international climate cooperation. • Significance of the partner country in cooperating with Germany, or in the context of international negotiations. • Solidity and quality of concept, presentation, expected project management and monitoring. • Availability of self-financing, third party financing, and financial leverage effect. • Projects should not have started and the duration should not be longer than six years. • The efficiency of the expenditures and costs and the economical use of the funds must be demonstrated (however currently these are no explicitly set ways of doing this). The IKI prioritises certain countries/regions according to its focus areas: Climate-friendly economy: • Small and medium-sized newly industrialising countries with a high greenhouse gas reduction potential • Consulting and capacity-building projects are preferred for the largest newly industrialising countries Adaptation: • Countries/regions that are particularly vulnerable to climate change Carbon sinks/REDD+ Biodiversity: • Countries and regions that are particularly relevant/suitable to carbon storage and biodiversity • Countries and regions particularly rich in biodiversity and/or an important role in the international CBD processes An investment decision is carried out on a project by project basis but whilst SMART indicators are preferred, the majority of indicators are qualitative and assessed based on expert judgement within the IKI. Projects applying for support must be based on the strategies and policies of the respective partner countries and take account of existing programmes and structures. The governments of the partner countries must express an explicit interest in the project.
European Investment Bank (EIB)	All projects deemed eligible for potential EIB finance undergo a due diligence process to assess technical, financial and economic performance of the project – also including an assessment of impacts on the environment. In addition to the integration of climate impacts within the technical, financial and economic assessment, a specific assessment is made, where relevant, of: • Whether a project has the potential to significantly reduce GHG emissions in a manner consistent with and eligible under the Kyoto Protocol's Clean Development Mechanism (CDM) or Joint Implementation (JI), thereby potentially generating carbon credits; and whether technical assistance (under the Climate Change Technical Assistance Facility – CCTAF) may be required by the promoter to tap this potential.

Institution/ Fund Name	Screening criteria
European Bank for Reconstruction and Development (EBRD)	• Whether the carbon footprint of a project is above the Bank's threshold (100ktCO_2e in absolute terms or 20kt CO_2e in relative terms). Where a project is likely to have a significant carbon footprint, this is assessed by the EIB using its proprietary sector-specific methodologies (cf. EIB Carbon Footprint Manual)[(83)]. The carbon footprint of a project is assessed both in terms of its absolute (or gross) emissions, and its relative (or net) emissions compared to the baseline. The baseline is the likely emissions of greenhouse gases into the atmosphere from an alternative credible source of supply to meet demand of the project. In addition to reporting aggregate absolute and relative emissions, since January 2012, the EIB discloses the carbon footprint assessments (both gross and net) of individual projects with significant emissions upon request. The 100kt CO_2e gross or CO_2e 20kt net limit is based on a pilot study of the bank's investments in projects in the first half of 2009. • Energy efficiency projects supported by the Bank need to demonstrate that they are economically justified on the basis of a classic cost-benefit analysis i.e. that the net present cost of the project over its life is less than the net present value of energy saved, including externalities. In addition, the Bank screens projects with the objective of ensuring that they are motivated by energy efficiency rather than simple replacement. The EIB also has specific eligibility criteria towards carbon intensive industries, as captured in sector lending policies for transport, energy and water. They provide an additional layer of safeguard beyond their standard technical, financial and economic viability tests. In operational terms, the most restrictive concerns coal and lignite power plants, though restrictions also apply to motorways and airports. An environmental performance standard has been introduced as part of the Bank's Energy Policy for fossil fuel projects – a threshold of 550gCO_2/kWh is used to screen the Bank's investments in fossil fuel generation projects. This threshold: • Essentially rules out coal based projects (which will typically have emission values greater than 800gCO_2/kWh), unless they employ a carbon capture and storage component. • Allows most combined cycle gas turbine plants. • Differentiates between biomass projects which co-fire fossil fuels; those that co-fire with a higher proportion of fossil fuels will not be funded, yet those which only use a small amount of fossil fuel can be approved. At the time of writing the EIB also had an eligibility criteria (screen) which ruled out energy efficiency projects which did not save equal to or more than 20% of energy against the baseline scenario, however as this 20% is not based on an in depth study and on the experience of investment staff, it will soon be updated to incorporate a more complete cost benefit analysis methodology (under development at time of writing). In 2010 the Bank developed a "toolkit" for identifying and managing climate change risks to investments. This includes guidelines for climate change screening and risk-profiling, as well as guidance on integrating risk assessment and adaptation into project feasibility studies, environmental and social impact assessments (ESIAs), environmental action plans and water audits. Specifically with respect to the eligibility of projects: • PR 1: Environmental and Social Appraisal and Management[(84)] • PR 3: Pollution Prevention and Abatement[(85)]

Institution/ Fund Name	Screening criteria
International Finance Corporation (IFC)	The purpose of project screening is to decide on the nature and extent of the environmental assessment needed for the project. Projects are categorised by the Environment Division into environmental review categories A, B, C, (decreasing in need for inspection for example), or Financial Intermediary (verification that the financial intermediary will be capable of and committed to meeting IFC requirements). The World Bank Group Environmental, Health, and Safety (EHS) guidelines [86] are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP), as defined in IFC's Performance Standard 3: Resource Efficiency and Pollution Prevention[87]. IFC uses the EHS Guidelines as a technical source of information during project appraisal activities, as described in IFC's Environmental and Social Review Procedures Manual[88]. In addition to Performance Standard 3 referenced above, the IFC has issued other performance standards[87] which define clients' responsibilities for managing their environmental and social risks. IFC quantify gross (absolute) GHG emissions as part of the appraisal process for all direct investments. In addition, IFC also quantifies GHG reductions (net) for all climate-related projects: direct investment, financial intermediaries, and advisory services. IFC developed the Carbon Emissions Estimator Tool (CEET) for estimating project GHG emissions. Carbon emission calculations are well integrated into the projects screening and design process, with investment officers and internal staff (as opposed to external consultants) using the CEET. Other criteria projects must meet include: • IFC energy efficiency projects must reduce total energy consumption by at least 15%[89]. • Fuel switch projects have a must have a 10% emissions reduction against the baseline scenario[90].
Asian Development Bank (ADB)	During the project identification / preparation stage of the project cycle, expert consultants are engaged to carry out technical, financial, economic and environmental due diligence. They will judge whether what a project proponent has stated is reasonable or not. Environmental screening ensures projects: • Conduct an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. • Assess potential trans-boundary and global impacts, including climate change. • Use strategic environmental assessment where appropriate. The bank has also devised a number of safeguards - Safeguard Requirements 1 (Environment) outlines the requirements that borrowers/clients are required to meet: • Pollution Prevention, Resource Conservation, and Energy Efficiency Safeguards - the borrower/client will avoid, or where avoidance is impossible minimise or control the intensity or load of pollutant emission and discharge. In addition the borrower/client will examine and

Institution/ Fund Name	Screening criteria
	incorporate in its operations resource conservation and energy efficiency measures consistent with the principles of cleaner production. • Greenhouse gas emissions - the borrower/client will promote the reduction of project-related anthropogenic greenhouse gas emissions in a manner appropriate to the nature and scale of project operations and impacts. Further to the environmental screening, FIRR and ERR assessments are undertaken in parallel. The bank has funding criteria that projects should have an ERR greater than 10%. The origin of this threshold is described as a "norm" by the ADB and has been in place since 1993, it is not changed dependent on technology or project host country. It is set at this level to ensure that economic gains are definitely going to be sufficient for investment to take place (i.e. even if the estimation of inputs is slightly optimistic). For public sector projects, the ADB will invest up to 100% of the cost of the project as it will be backed by a sovereign guarantee. In private sector projects, ADB will not invest more than 25%, from a risk perspective rather than to mobilise private sector capital to ensure VfM. Finally, projects are screened to make sure that they are aligned with key bank strategies and plans such as Strategy 2020[91], country partnership strategies[92] and country operations business plans[93].
Inter-American Development Bank (IDB)	The IDB does not have formal tools for incorporating climate change into investment decisions, but has some tools that are recommended (or used on an ad-hoc basis) by sector – e.g. IDB Biofuels Sustainability Scorecard, Tourism Sustainability Scorecard for Private Sector Projects, RET Screen (for RE projects). The IDB is, however, developing tools to assess the vulnerability of the projects it finances to climate variability and change. The Bank's has a suite of GHG guidelines on landfills, cement plants, and coal-fired powered plants. These set minimum climate change performance criteria in order for Bank clients to comply with a specific GHG emissions threshold (from Sustainability Report 2011). Under the IDB's Environmental Safeguards Compliance Policy (2006) as part of agreed mitigation measures, the Bank may require that the borrower, where feasible and cost effective, adopt cleaner production processes, energy-efficiency or renewable energy.
KfW (German) Development Bank	KfW Development Bank requires projects to conduct an environmental and social impact assessment (ESIA) and a climate change assessment to address the potential environmental/climate change impacts of projects, as well as the recipient country's commitment to such issues. The ESIAs consist of an initial screening for relevant environmental, climate, and/or social impacts; a scoping or assessment of identified consequences and/or risks (whereby projects and programs are categorised based on the degree and scope of expected impact); and the design and implementation of an environmental and social impact study and/or climate change adaptation, or mitigation, assessment. The GHG reduction assessment consists of an evaluation of GHG emissions in the project area/sector and an estimation of the project impacts on these expected emissions. KfW Development Bank does not provide any tools or estimation methodologies for baseline setting. KfW Development Bank and GIZ prepare data sets on their projects using the OECD (Development Co-operation Directorate DAC) coding. Germany's BMZ

Institution/ Fund Name	Screening criteria
	has the final responsibility to carry out quality assurance and report the data set. All projects are assessed for their viability on their own basis; Rio markers are then attributed to relevant projects (climate finance is not considered a separate funding stream). In addition, for mitigation, KfW Development Bank has an internal definition for energy efficiency projects, which includes both grounds for inclusion and exclusion from the definition of climate finance. This has not been published, but aspects of this definition may be shared on request. Renewables, energy efficiency and transport projects are prioritised to achieve targets.
AFD (French Development Agency)	AFD has developed a project selectivity matrix for selecting projects; this defines exclusion criteria for projects that would not be funded based on a combination of their GHG characteristics and geography. This criterion combines with others in AFD's standard impacts analyses, such as poverty reduction, local employment, and other social or environmental criteria. The approach is tailored to countries' different development levels, and aligns with AFD's mandate. AFD uses this project selectivity matrix to identify projects in compliance with its mandates and its primary role, supporting economic and social development.
Nordic Climate Facility (NCF) (94,95)	Projects should satisfy standard economic and social tests (or be expected to if not easily quantified) at the national level. Projects should have a significant climate component, i.e. the global benefits of GHG emission reduction or carbon sequestration should be at least 10% of project investment costs. While providing support for economically justified climate change projects is the core objective of NDF, the two conditions are in practice minimum requirements; many projects may satisfy the conditions but for one reason or another may not be considered suitable – or at least of sufficiently high priority – to warrant NDF support. The NCF operates by providing grant financing to Nordic organisations who develop projects with partner domestic organisations in target countries. Key requirements of applicants to the fund: The applicant must be an active institution, organisation, company or authority holding a registered place of operations in Denmark, Finland, Iceland, Norway or Sweden with relevant experience: • The applicant shall have one or more eligible local partners in a country in which the project is proposed to be implemented. • The applicant's average annual audited turnover for the past two years must have exceeded the NCF funding applied for in NCF1-NCF3, and be twice the funding in NCF4. In case the applicant alone cannot fulfil this requirement, the applicant is allowed to be supported by another Nordic institution, organisation or company. The project must be implemented in at least one of the following eligible countries: • Africa: Benin, Burkina Faso, Cape Verde, Ethiopia, Ghana, Kenya, Malawi, Mozambique, Rwanda, Senegal, Tanzania, Uganda, Zambia, Zimbabwe. • Asia: Bangladesh, Cambodia, Kyrgyz Republic, Lao PDR, Maldives, Mongolia, Nepal, Pakistan, Sri Lanka, Vietnam. • Latin America: Bolivia, Honduras, Nicaragua.

In order to provide more detail, the particular screening processes of the IDB and EIB are examined more closely.

- **The IDB**

The IDB estimates the expected annual GHG emissions for each carbon intensive operation before approval of IDB financing. This information is generated in the Environmental Impact Assessment (EIA) process or by the project team at the IDB using their GHG accounting methodology(96). In addition, the IDB has a suite of GHG guidelines on landfills(97), cement plants(98), coal-fired powered plants(99) and oil and gas power plants(100). These set minimum climate change performance criteria in order for Bank clients to comply with a specific GHG emissions threshold, i.e. minimum energy efficiency and maximum GHG emissions limits. If a proposed project's carbon footprint is too high (i.e. exceeds guidelines for the sectors they are in place for) then the bank will not immediately reject the project but will instead begin a dialogue with the project proponent. However, there are no exceptions to thresholds (as with the EIB below for example). It is important to note that minimum climate change criteria and GHG performance standards are currently only available for the four sectors listed above, and not available for renewable energy or energy efficiency projects.

- **The EIB**

The EIB has a strict environmental performance standard (EPS) of 550gCO_2/kWh to which all fossil fuel projects must adhere. However, any fossil fuel power plant with a specific emission in excess of the EPS can be financed where it contributes to security of supply on isolated energy systems such as small islands with no feasible mainland energy connection – and only where there is no economically viable alternative." (101)

The EIB's method provides flexibility in that a 550gCO_2/kWh threshold will typically:

- Rule out coal based projects (which will usually have emission values greater than 800gCO_2/kWh), unless they employ a carbon capture and storage component.
- Allow most combined cycle gas turbine plants.
- Differentiate between biomass projects which co-fire fossil fuels; those that co-fire with a higher proportion of fossil fuels will not be funded, yet those which only use a small amount of fossil fuel can be approved.

Neither approach (i.e. IDB or EIB) can be considered better than the other but it demonstrates the differences in approval process that can be found between institutions on this subject.

Different institutions have produced guidelines in different areas and these are not so relevant in this study (e.g. noise level limits), but those set around renewable energy and energy efficiency projects are not common.

Non-investment based screening such as conformity with national laws of the host country is beyond the scope of this report.

A. Cost per Tonne of Carbon Dioxide Saved

Consultees in the DBs did not consider the cost per tonne of carbon dioxide saved as a value for money indicator which could rule a project out; whereas it was found to be an indicator used by the CDFs as screens and investment criteria as it was in their mandates. All DBs and CDFs raised concerns over the comparability of methodologies to calculate cost of savings and, further, the rationale for this indicator's use. Methodologically, the costs are that it is difficult to compare like for like as the cost of capital varies depending on the investment:

- Loans, grants and guarantees cost institutions differing amounts to provide. Hence, the value of a unit of investment will be different.
- Loans can be senior debt, mezzanine debt or subordinated debt.

Therefore comparing the cost-effectiveness of different financial instruments should be approached with caution.

As well as differing financial instruments used by banks, whether costs are considered incrementally (net of the baseline scenario) or absolutely (gross) is another consideration. The GEF provides incremental finance for funding. For example, if the baseline scenario is the construction of a USD2m coal plant, and the proposed project is a USD6m wind power project, the GEF will provide up to USD4m of funding. On the emissions side of this example, in the case of a grid where there is mainly coal fired plants but the trend is moving towards a gas fired grid, the carbon savings will be worked out assuming that gas is the baseline scenario by the GEF. Others may use a fossil fuel baseline in considering the same proposal, again making like for like comparisons difficult.

The GEF does not have cost per tonne rules, but cost per tonne reduced can be used as a guide. The Secretariat has a rough idea of what cost per tonne should be (based on past experience and expert judgement), and this is usually in the range of a few dollars per tonne to tens of dollars per tonne of carbon dioxide abated. If greater, then a discussion will be had with the proposing agency to see if there have been some gains which have not been included in the business proposal. The GEF Secretariat will also discuss with the proposing agency whether the project can be modified to generate more GHG reductions or other benefits. But even if emissions are high, this will not necessarily mean a "red line" is crossed e.g. when supporting projects involving innovative technologies, it is very difficult to assess these on a cost per tonne basis.

With respect to methodological concerns, the GEF does not have typical methodological issues over calculating cost per tonne of carbon dioxide (discussed further below) as the GEF divides its total incremental input (dollars) by tonnes of carbon dioxide reduced. Hence, whether the dollars are used for CAPEX only, CAPEX and OPEX etc., it does not matter; it just considers the total GEF investment and expected project carbon dioxide avoided.

Cost per tonne of carbon dioxide is part of the *ex-ante* project review process, and used as a secondary indicator after being assured that the funds required are incremental and will lead to additional emission reductions not possible without GEF support. That said, the GEF team will reject a proposed project if the cost per tonne of carbon dioxide is too high; although there are no rules or set thresholds as to what is "too high".

However, whilst the GEF may use cost per tonne of carbon dioxide avoided as a basis to rule a project out, this is as a last resort after dialogue. Also, the per the GEF's own Evaluation Office report, there is a good quality methodology in existence for *ex-ante* estimations of emission reductions, for *ex-post* "the methodology to measure GHG emissions and to calculate emission reduction at project completion is not robust and contains uncertainties."(102) Also, setting thresholds around cost per tonne is difficult because as per the GEF's Manual for Calculating GHG Benefits of GEF Projects (2008), "it is important to note that no methodology that quantifies GHG emission reduction effects for GEF projects can fulfil all purposes. In particular, no methodology that results in one aggregate number for the portfolio can provide meaningful and comparable values for GHG abatement costs (USD/tonne) because of the following:

a) The GHG emission reductions are achieved using many different avenues in GEF projects.
b) The weights of these avenues vary greatly among different projects.
c) In the interest of sustainability and replicability, the GEF-sponsored part of the project often focuses on investments that have long-term cost-reduction effects (e.g., through capacity building or enabling environments), but by themselves do not have impacts on GHG emissions." (103)

However, since the manual was written in 2008 the GEF and its partners have improved the methodologies used to estimate the GHG emission reductions impacts of GEF projects. New methodologies have for example been drafted for energy efficiency and transport related projects. This effort continues with a dialogue that is being developed with GEF Agencies and the STAP to improve estimations for ex-post impacts and indirect impacts. This follows on from a recommendation by the GEF Evaluation Office Annual Impact Report of November 2013(104) which recommended continuing to work on developing methods for measuring emission reductions as a result of projects.

Continuing on the emissions reductions side, reporting on tonnes reduced / avoided is not as straightforward as might be expected. The CTF is a fund which has in its guidelines a screen which ensures that it does not ordinarily provide co-financing to projects and programmes with a marginal abatement cost of carbon dioxide greater than USD200/tonne. However, as per the Trust Fund Committee document CTF/TFC.12/7, "Cost-Effectiveness of CTF Projects"[1] (October 8th, 2013), this threshold was not used operationally at the time of writing of this paper. Instead, the document reports that "In practice, CTF proposals at the time of submission to the Trust Fund Committee for funding approval typically provide an estimate of cost-effectiveness as tons of CO_2-e reduced per dollar of CTF investment. Some proposals also provide an estimate of tonnes of CO_2-e reduced per dollar of total investment (which includes CTF funds plus co-financing). Among the 36 CTF projects approved by the Trust Fund Committee and reported in May 2013 semi-annual operational report, preliminary estimates suggest that the cost-effectiveness of CTF projects averages about CTF USD4/tonne CO_2-e, ranging from less than CTF USD1 to CTF USD40 per tonne of CO_2-e reduced." It goes on to say that the wide range of dollar per tonne avoided estimates can be attributed to a number of factors: (a) technologies deployed, (b) investment strategies, (c) level of co-financing, and (d) methods used to estimate GHG emission reductions.

Of more general concern methodologically when reporting emissions is whether they are reported gross or net, this must be confirmed when benchmarking in order to be comparing like for like. According to the IDB's Greenhouse Gas Assessment Methodology(105):

1 https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_TFC.12_7_Cost_effectiveness_of_CTF_projects.pdf

- Gross GHG emissions are significant scope 1 (direct) and scope 2 (associated with the offsite generation of electricity, heat, and steam used by the project. Scope 3 (indirect emissions)) are CO_2e emissions in the geographic boundaries of the financed project that are generated during the first year of full operation / production and may include construction emissions averaged over the project lifetime.
- Net GHG reductions of the financed project are quantified relative to a baseline.

As can be seen, if reporting gross, the extent to which scope 3 emissions (indirect emissions) are included could change the comparability of results.

Further, when calculating emission reductions (net emissions), it must be understood that working out baseline emissions is not a standardised process. For example, one can work out a weighted average of the contribution of different generating units to arrive at a grid emission factor for a country's grid, which can be used to work out emission reductions from a proposed renewable project. The EIB has particularly developed this idea, providing greater accuracy by not only introducing the concept of build margin and operating margin into baseline calculations, but also the idea of weighting them differently depending on national circumstances.

It should be noted that in November 2012, a range of international finance institutions set out a policy for harmonised greenhouse gas reporting (this is discussed in Section 4 below).

The Nordic Climate Facility (NCF) also uses cost per tonne of carbon dioxide as a screen which is quite innovative. Their guidelines state "Projects should have a significant climate component, i.e. the global benefits of GHG emission reduction or carbon sequestration should be at least 10% of project investment costs.

Determining "significance" requires estimation of the annual reduction in greenhouse gas emissions over the lifetime of the project, i.e. a "with and without project" comparison. This includes assessment of net changes – which may be positive or negative – in GHG emissions during the project construction phase. Complex technical assessment will typically be required of the impacts of such activities as energy efficiency investments; replacement of fossil fuels by renewable sources; transport investments; or carbon sequestration.

The annual global benefits of reducing GHG emissions should then be calculated by multiplying the reduction in the number of tons of CO_2 emitted by a figure representing the social value (in monetary terms) per tonne of such reduction.

The present worth of the stream of annual global benefits of greenhouse gas emission reduction stemming from the project should then be compared with project investment costs. The test for climate significance will be passed if the present worth of benefits thus calculated exceeds 10% of project investment costs. Assumptions about critical variables should be highlighted where major uncertainties exist - in particular the value per tonne of CO_2 emission reduction that would satisfy the 10% criterion." [106]

The "complex technical assessment" mentioned above will be carried out by specialist staff at the NCF; specialist consultants are also employed by most DBs as is necessary. The guidelines referenced then go on to discuss the difficulties and issues around defining the "social cost" of GHG emissions.

B. Cost per Megawatt of Renewable Power

Analysis of the costs of generation equipment are used by almost all DBs and CDFs as part of the due diligence process; costs are not however benchmarked to ensure value for money. Again, respondents had concerns over this simplifying the investment decision process, in particular:

- A project could have a low cost per megawatt but still be “a poor project” if the load factor were low or the technology selected is of low quality.
- A project could have a high cost per megawatt but still be “a good project” if the PPA price were high and / or if the plant load factor were particularly high.
- Biomass installed capacities can vary a lot, as can their costs to install. But of much greater concern are the fuels used and the procedures in place to address potential leakage. Cost per megawatt here therefore needs to be particularly carefully considered as a benchmark.

Also, a project which is transformational or involves technology which has low penetration rates in a country (e.g. a renewable project in a fossil fuel rich country) will have high investment costs but can still deliver positive results. Hence, this indicator is usually considered as part of overall project cost which in turn is a key component of the FIRR / ERR calculation (primary investment criteria).

Another use of cost per megawatt is as an additionality test or screen; if the cost per megawatt is too low, then questions are raised about the additionality of the project, i.e. would it have happened without climate / concessional finance?

C. Public and Private Finance Leveraged

As with the cost per tonne of carbon dioxide abated, the amount of finance leveraged as a result of the project (often known as the amount of “co-investment”) is assessed more closely by CDFs than DBs. Again, this is linked entirely to the mandates of the CDFs. All three interviewed CDFs require a level of co-investment in order to disburse grants.

For example, the GEF requires any other financing that is required for the project to proceed is to be substantiated *ex-ante* at the approval stage. This is termed “co-financing”. Any financing related to the project that comes about after the release of funds by the GEF is termed “leveraged finance”. Leveraged finance in GEF terms is not assessed by the GEF *ex-ante*, but is monitored *ex-ante* using their tracking tool (see Section 4). Co-financing, which can be public or private investment, is financing deemed necessary to achieve the project objective and leveraged finance is a by-product. During interview it was highlighted that past experience from the GEF’s own pipeline show the level of co-financing that may be achievable for a given investment; e.g. energy efficiency has sub-sectors where the following could be expected (but these are not thresholds which need to be met):

- Energy efficiency with respect to appliances and equipment may see ratios of 3-5:1
- Energy efficiency with respect to heating may see ratios of 20:1

i.e. USD20 leveraged for every USD1 invested by the GEF.

The Nordic Climate Facility scores projects as part of its evaluation procedure and has a very different target for co-investment: 20% of finance for each project should come from other sources. The higher the level of co-investment, the higher the project’s score. In fact, the current portfolio is going beyond targets at the time of writing with a score of 49% co-financing on average in the third call for funds (NCF3). This has increased from NCF2 (30%) and NCF1 (39%).

It should be noted that when DBs attract private investment, confidentiality of investments can mean that data available here is limited.

Economic Appraisal, Going Beyond Financials of Projects

Consider an economic analysis of a wind power plant, the baseline scenario being the investment in a coal power plant which would emit a constant 1,000,000 tonnes of carbon dioxide per annum to generate as much electricity as the proposed wind power plant (assume thirty year technical lifetime for each). Whilst very low annual operational expenditure is required for the wind power plant, the initial high capital expenditure may make the LCOE higher than that of the coal fired power plant. However, being an economic analysis, the EIB applies a shadow price of carbon as an expense to the coal fired plant which increases the annual costs and hence the overall LCOE. Depending on the cost of carbon used, it could result in the LCOE of the wind power plant being lower than that of the coal fired power plant, meaning it passes the EIB's economic test for investment. EIB currenly uses the following shadow prices:

Price Scenario	Value 2010 emission (EUR)	Annual adders 2011 to 2030 (EUR)
High	40	2
Central	25	1
Low	10	0.5

Further, reflecting a common finding that the marginal damage of emissions increase in function of the atmospheric concentrations of carbon, annual "adders" are applied after 2010: i.e. an absolute increase in value per year (measured in constant 2006 prices) shown in the table above. Hence an emission in 2030 under the central estimate equals 25 + (20x1) = EUR45.

In the above example then, one can see that in year one, an expense of EUR25m is added to the costs of the coal fired power plant assuming the central price scenario is used. In 2030, the cost of carbon to wider society would be an expense of EUR45m added to the project cost, raising the LCOE to a point which could make the wind power project the more economically attractive option.

D. Levelised Cost of Energy by Technology

Levelised cost of Energy (LCOE) is used by the EIB as a primary economic indicator. For a mature renewable power plant to be deemed economically viable, it must have an LCOE equal to or lower than the baseline alternative, adjusting for any differences in expected output profile between technologies.

Uniquely, in its economic analysis, the EIB adds a shadow price of carbon to the levelised cost of fossil fuel alternatives, which makes the LCOE of the fossil fuel plant higher, and the renewable plant more economically feasible following the above test. This is a useful example of how a development bank assesses the economic attractiveness of a project[(107)].

The CTF is now at a stage where it is monitoring this parameter more closely. It is suggested that "CTF proposals will provide an analysis, where applicable and feasible, of the expected reduction in the cost of the technology due to technological progress and scale effect at a global level, and/or through organisational learning and scale effects at the country level."

Others look at LCOE during the project appraisal process, but again it is used more as an informal benchmark (a "red flag") than a threshold ("red line") which could lead to the approval / or rejection of an application for funding.

E. Cost per Person of Access to Clean Energy

This indicator is not used by any of the DBs and CDFs who took part in the consultation. It is a reporting requirement of SREP but projects are not benchmarked on this indicator.

One consultee expressed a view that this indicator can make a project look like poor value for money if access to clean energy is not a main objective of the project. Whilst every project does not have to report on every indicator, if some projects in an DB's or CDF's portfolio do and others do not, this could lead to a claim of not being transparent.

Appendix H Sample Data for Benchmarking

Source	Indicator	Benchmark Value	Geographical Focus (if any)	Hyperlink to document
Energy Sector management assistance program (ESMAP)	The tool includes 28 key performance indicators collected from 93 cities around the world. Examples: • Citywide indicators (such as energy consumption per unit of the city's GDP) • Sector-specific variables (such as electricity consumption per light pole)		Developing countries	The Tool for Rapid Assessment of City Energy (TRACE)
International Renewable Energy Agency (IRENA)	Levelised Cost of Energy (LCOE)	2010 prices • Onshore wind (10%): USD 0.06 to USD 0.14/kWh • Offshore wind (10%): USD 0.13 and USD 0.19/kWh		Renewable Energy Technology Cost Analyses- Wind Power
	Levelised Cost of Energy (LCOE)	2011 prices (10%) • Base system: between USD 0.25 and USD 0.65/kWh • With storage: between USD 0.36 and USD 0.71/kWh • Thin-film: USD 0.26 and USD 0.59/kWh		Renewable Energy Technology Cost Analyses- Solar PV
	Levelised Cost of Energy (LCOE)	2011 prices (10%) biomass-fired: between USD 0.06/kWh and USD 0.29/kWh		Renewable Energy Technology Cost Analyses- Biomass
	Levelised Cost of Energy (LCOE)	USD 0.012/kWh for additional capacity at an existing hydropower project • USD 0.19/kWh for a 1 MW small hydro project with a capacity factor of 30 % • The weighted average cost of all the sites evaluated was USD 0.048/kWh.		Renewable Energy Technology Cost Analyses- Hydro Power
	Levelised Cost of Energy (LCOE)	2011 prices (10%) • parabolic trough plants: between USD 0.20 to USD 0.36/kWh		Renewable Energy Technology Cost Analyses- CSP

Source	Indicator	Benchmark Value	Geographical Focus (if any)	Hyperlink to document
		• solar towers: between USD 0.17 and USD 0.29/kWh • high solar resources: USD 0.14 to USD 0.18/kWh		(Concentrating solar power)
European Bank for Reconstruction and Development (EBRD)	Policy, regulatory and institutional benchmarks- Power and Energy • Implemented / Improved tariff methodology • Full / Partial cost recovery tariffs achieved • Implementation of a market-based and other efficient support schemes for RE / energy efficiency • Energy legislation adopted • Elimination of possible adverse policy incentives (e.g. dirty fuel subsidies) • Development of tariff methodology for renewable energies • Increased taxation on non-RE sources achieved Process Related Benchmark: Environmental Benchmarks • Decrease in energy consumption by implementation of new technologies (in Municipal and Environmental Infrastructure), • Completion of BREEAM certification (in Property and Tourism) • Implementation of wastewater treatment programmes' (in General Industries) • Implementation of Carbon financing • Adoption of a new RE law • Removal of barriers in connecting RE projects to the grid • Strengthening of an independent regulator Outcome-targeted benchmark: Specific Environmental Benchmarks			Transition Benchmarks: How the EBRD monitors projects performance

Source	Indicator	Benchmark Value	Geographical Focus (if any)	Hyperlink to document
	(i) carbon emissions reduction • Reduction in carbon emissions (ii) energy efficiency improvements • Reduction in energy usage • Energy performance better than national reference energy baseline achieved • International standard energy efficiency certification process completed • Decreased water usage • Reduced commercial and technical losses (iii) Renewable energy (RE) support. • New Wind farm projects • New biomass projects			
US Energy Information Administration	U.S. average levelised costs (2011 $/megawatthour**)** for plants entering service in 2018	**Plant type** / **Total system levelised cost (2011 $/megawatthour)** *Dispatchable Technologies* Conventional Coal: 100.1 Advanced Coal: 123.0 Advanced Coal with CCS: 135.5 Conventional Combined Cycle: 67.1 Advanced Combined Cycle: 65.6 Advanced CC with CCS: 93.4 Conventional Combustion Turbine: 130.3 Advanced Combustion Turbine: 104.6 Advanced Nuclear: 108.4 Geothermal: 89.6 Biomass: 111.0		Levelised Cost of New Generation Resources in the Annual Energy Outlook 2013

Source	Indicator	Benchmark Value	Geographical Focus (if any)	Hyperlink to document
		Non-Dispatchable Technologies Wind 86.6 Wind-Offshore 221.5 Solar PV 144.3 Solar Thermal 261.5 Hydro 90.		
Energy Regulators Regional Association (ERRA)	Heat prices, margins and policies • Average, nominal heat tariffs, EUR/MWh • Purchasing power parity (PPP) adjusted heat tariffs, EUR/MWh • Sales margin ratios, % • EBITDA margin ratios, % (Operating margin = Revenues ./. Fuel costs . /. OPEX) • EBIT margin ratios, % (Operating profit = EBITDA ./. Depreciation) Cost efficiency • Fuel and related (variable) costs per produced energy, EUR/MWh • Personnel and other operational (fixed) costs (OPEX) per produced energy, EUR/MWh Profitability • Return on equity, % (ROE) • Return on capital employed, % (ROCE) Sustainability • Share of renewable energy sources (RES) in heat production, % • Specific CO_2 emissions, g/kWh		Hungary, Poland, Lithuania, Estonia and Finland	Benchmarking study of District Heating in Hungary, Poland, Lithuania, Estonia and Finland.
Best practices benchmarking for Energy Efficiency Programmes	• cost effectiveness (e.g., $ per kWh saved, TRC, etc.); • net market penetration rates, • participant adoption rates, • measure saturation levels • sustainability/market effects			

Source	Indicator	Benchmark Value	Geographical Focus (if any)	Hyperlink to document
European Wind Energy Association (EWEA)	Generating Cost of Wind Power	2003 prices • Site with good wind: 0.04-0.05€/kW • Average: 0.06-0.08€/kW Projected 2010 cost Average: 0.04€/kW		Wind Energy Costs investment Factors
European University Institute	CO_2 abatement cost (€/tCO_2) Calculated this using: • Remuneration to generators • Additional cycling costs • Additional balancing cost • Fuel cost saving • Carbon cost saving • Capacity saving • Merit order effect	Solar = 537 €/tCO_2 Wind = 44 €tCO_2	Germany	The Cost of Abating CO2 Emissions by Renewable Energy Incentives in Germany
US Department of Energy (US DoE)	• Project Installation Costs (\$/ft^2) • Annual Reported Savings (kBtu/ft^2, kWh/ft2, and % of baseline energy • Simple Payback Time (Years)		USA	Federal Government Project Performance Benchmarks (All ASHRAE Zones)
REN 21	• Capital Costs(USD/kW) • Typical Energy Costs (LCOE – U.S. cents/kWh)	<table><tr><td>Technology</td><td>Capital Costs (USD/kW)</td><td>**Typical Energy Costs** (LCOE – U.S. cents/kWh)</td></tr><tr><td>Geothermal power</td><td>Condensing flash: 2,100–4,200 Binary: 2,470–6,100</td><td>Condensing flash: 6–13 Binary: 7–14</td></tr><tr><td>Ocean power: Tidal range</td><td>5,290–5,870</td><td>21–28</td></tr><tr><td>Hydropower: Grid-</td><td>Projects >300 MW: <2,000</td><td>2-12</td></tr></table>		Renewables 21: Global Status Report *Note: Equivalent data are available for Bioenergy, Solar PV, CSP and wind technologies for power generation, Hot Water/Heating/Cooling, transport fuel and technologies for rural energy.*

Source	Indicator	Benchmark Value			Geographical Focus (if any)	Hyperlink to document
		based	Projects <300 MW: 2,000–4,000			
		Hydropower: Off-grid/rural	1,175–3,500	5-40		
	External cost of electricity production (Cents/kWh)	**Cents/kWh Coal** No. estimates Min Max Mean	**Coal** 36 0.01 90.61 18.75			The True cost of Electricity *Note: Equivalent data are available for Oil, Nat. Gas, Nuclear Hydro Wind Solar Biomass*
International Atomic Energy Agency (IAEA)	**Economic Indicators** • Energy Use per Capita • Energy use per unit of GDP • Efficiency of Energy Conversion and distribution • Reserves-to-production ratio • Resources-to-production ratio • Industrial energy intensities • Agricultural energy intensities • Service/ Commercial energy intensities • Household energy intensities • Transport energy intensities • Fuel share in energy and electricity • Non carbon energy share in energy and electricity • Renewable energy share in energy and electricity • End use energy prices by fuel and by sector				Developing Countries	Energy Indicators for Sustainable Development

Source	Indicator	Benchmark Value		Geographical Focus (if any)	Hyperlink to document
National Renewable Energy Laboratory (NREL)	Levelised Cost of Energy (LCOE) €/MWh ($/MWh)	Country Switzerland Netherlands Germany Spain Sweden United States Denmark) Reference Case	LCOE €/MWh ($/MWh) 120(167) 94 (131) 85 (118) 83 (115) 67(93) 65(91) 61 (85 (68)95		Multi-national Case Study of the Financial Cost of Wind Energy
Energy Regulators Regional Association (ERRA)	Heat prices, margins and policies • Average, nominal heat tariffs, EUR/MWh • Purchasing power parity (PPP) adjusted heat tariffs, EUR/MWh • Sales margin ratios, % • EBITDA margin ratios, % (Operating margin = Revenues ./. Fuel costs . /. OPEX) • EBIT margin ratios, % (Operating profit = EBITDA ./. Depreciation) Cost efficiency • Fuel and related (variable) costs per produced energy, EUR/MWh • Personnel and other operational (fixed) costs (OPEX) per produced energy, EUR/MWh Profitability • Return on equity, % (ROE) • Return on capital employed, % (ROCE) Sustainability • Share of renewable energy sources (RES) in heat production, %				Benchmarking study of District Heating in Hungary, Poland, Lithuania, Estonia and Finland

Source	Indicator	Benchmark Value		Geographical Focus (if any)	Hyperlink to document
	• • Specific CO2 emissions, g/kWh				
UNIDO	Energy Efficiency Index	**Petroleum refineries (2003)** Selected Industrial Countries Selected Developing countries Global Average Best Available Technology (BAT)	**Ranges for average energy use in Energy benchmark data** 0.7-0.8 1.3-3.8 1.25 1		Global Industrial Energy Efficiency Benchmarking: An Energy Policy Tool *Note: Equivalent data are available for the following industrial sectors: Iron and steel, Pulp and paper, Textiles, food and beverages and Foundries*
World Bank	Energy consumption	Sector Iron and steel Cement	Best Available Practice Benchmark Practical minimum energy consumption for a blast furnace is 10.4 GJ/t iron. Dry-process kilns thermal energy consumption: 2.9–3.3 GJ/t clinker. Dry-process kilns electricity consumption: 95–100 kWh/t cement.		Sustainable Energy for All (SE4ALL) Global Tracking Framework *Note: Equivalent data are available for the Chemicals and Petrochemicals, Aluminium, pulp and paper industries.*
International Energy Agency (IEA)	• Thermal energy efficiency of equipment – energy value available for production/operation divided by input energy value, • Energy consumption intensity – energy			Assessing Measures of Energy Efficiency Performance	

Source	Indicator	Benchmark Value		Geographical Focus (if any)	Hyperlink to document
	value divided by certain physical value • Absolute amount of energy consumption – energy value, and • Diffusion rates of energy efficient facilities/types of equipment.			and Their Application Industry	
	Capital cost ($2010 per kW)	**Renewables - regional details** Hydropower - large-scale Europe United States Japan Russia China India Middle East Africa Brazil	**Capital cost ($2010 per kW)** 2230 2490 2450 2030 1450 1870 1980 2330 2490		IEA – World Energy Outlook- Investment Costs *Note: Equivalent data are available for coal, gas, nuclear and other renewables.*

Appendix I Benchmarking from a Project Developer's Viewpoint

Case Study: Turkey Private Sector Sustainable Energy Financing Facility

The Turkey Private Sector Sustainable Energy Financing Facility (the "Facility" or "TURSEFF") provides USD200 million[2] under which credit lines will be provided by EBRD to at least four banks in Turkey for on-lending to (i) commercial energy efficiency investments; (ii) stand-alone small scale renewable energy investments; (iii) buildings sector energy efficiency and renewable energy investments; (iv) energy efficiency and renewable energy in the residential sector; and (v) investment loans for eligible manufacturers, suppliers and installers of energy efficiency and renewable energy technology, equipment and materials.

The Facility will be supported by a Project Consultant (MWH) and an *ex-ante* Monitoring Consultant, the cost of which will be financed by the Clean Technology Fund and the European Commission under a donor-funded agreement.

The Facility proceeds may be lent-on for five categories of investments:

- Commercial energy efficiency investments;
- Stand-alone small scale renewable energy investments;
- Buildings sector energy efficiency and renewable energy investments;
- Energy efficiency and renewable energy in the residential sector; and
- Investment loans for eligible manufacturers, suppliers and installers of energy efficiency and renewable energy technology, equipment and materials.

The maximum individual sub-loan amount shall be:

- USD 5 million for Energy Efficiency, Renewable Energy and Commercial Buildings Sector Sub-projects;
- USD 300,000 for Small Scale Sub-projects;
- USD 75,000 for Residential Sector Sub-projects and
- USD 1 million for investment loans to Energy Efficiency Suppliers

A List of Eligible Materials and Equipment (LEME) tool has been implemented and regularly updated by TurSEFF team in the last two years and half along TurSEFF phase I. It includes pre-defined categories of equipment with specific minimum technical characteristics that are proven to result in fundamental and straightforward improvements in energy efficiency. The open-list of automatically eligible equipment and services has been kept up-to-date and it is made publicly available on the Facility's web site.

The latest version of the LEME list includes 28 different eligible technologies.

A set of eligibility criteria for each eligible technology has been already set-up. The approach for the definition of these criteria took into account the following:

- Energy performance of new equipment and systems available in the local market
- Energy performance of new equipment and systems representing BAT (Best Available Technologies)
- Average energy performance of equipment and systems in the existing reference stock
- Performance requirements set by national standards and regulations.

[2] USD 160 million of EBRD loans will be co-financed by USD 40 million of concessional loan funding from the Clean Technology Fund (CTF).

Each system has been divided in technologies which in turns are divided in sub-technologies which are equipment specific. A unique Code (A-1, D-3 etc.) has been assigned to each technology in order to quickly identify it. The comprehensive table of equipment includes the following:

- List of eligible systems (nine items);
- List of eligible technologies (thirty-one items)
- List of eligible sub-technologies (eighty-seven items).

The **reference baseline** for a specific technology is defined as the energy performance benchmark reflecting the common practice in the given country and/or the national regulations, whichever is higher. Where national regulations are not specific enough on requirements at the technology level, the common practice in the given country is used as a reference.

The extent to which the performance requirement should go beyond the reference baseline differs for each specific technology and is set according to four major principles:

1. Technological progress
2. Maturity of market supply
3. Market penetration rates
4. Technology costs

The key task of the MWH's study consists of assessing each technology against the four major principles outlined above. Given the long list of equipment for each technology, this report has selected a representative item of equipment for each item (i.e.50 kWe electric motor).

The outcome of the study allows the EBRD to estimate the extent in percentage to which the performance requirement should go beyond the reference baseline for each technology and to define a new minimum performance requirement.

Task 1 – Definition of new reference baseline

The former LEME has been revised to the light of most recent national and international regulations. The existing minimum performance indicators have been revised accordingly and they have been used as the reference baseline for the definition of the new minimum performance indicators (based on the four major principles outlined in the previous paragraph and described in the following task).

Task 2 – Definition of percentage increase for minimum performance indicators based on the four principles

The extent (in percentage) to which the performance requirement goes beyond the reference baseline is set up according to the four major principles described above.

Sub-Task 2.1 - Technological progress

A study has been performed to identify the technological progress in the last years for each technology. This has been completed by the experienced TurSEFF team and consultation with suppliers.

The extent to which minimum efficiency performance standards should improve upon industry standards are:

- A technology without any strong technological progress in recent (ten) years is set a minimum performance indicator of 25% improvement over the reference baseline.
- A technology with strong technological progress in recent (ten) years is set a minimum performance indicator of at least 20% improvement over the reference baseline, depending on the maturity of the local market.
- Exceptions for performance indicators at a level lower than 20% will be allowed upon approval by the Bank for specific best available technologies, where the scale of improvement does not allow the achievement of the required 20% improvements over the reference baseline.

Sub-Task 2.2 - Maturity of market supply

A study has been performed to identify the maturity of market supply for each technology. This has been conducted by the experienced TurSEFF team. List of Eligible Suppliers and Installers (LESI) list includes all the suppliers which have provided such kinds of technology under TurSEFF in Turkey. The number of suppliers and their location for each technology has been analysed.

The extent to which minimum efficiency performance standards should improve upon industry standards are:

- A technology with a small number of market suppliers with a permanent presence in the national market is set a minimum performance indicator of 20% to 25% above the reference baseline.
- A technology with a well-established set of market suppliers with a permanent presence in the national market is set a minimum performance indicator of between 25-35% above the reference baseline, depending on the recent technological progress made.
- For larger countries (e.g. Russia, Turkey, Ukraine) it is important that even remote regions beyond the capital cities have sufficient and competitive supply of technologies under consideration.

Sub-Task 2.3 - Market penetration rates

A market penetration analysis has been performed to estimate the adoption of each efficient technology compared to the total existing Turkish market for that technology regardless its efficiency.

The total market also includes those who could take advantage of the market of that technology. The market penetration rate will be given as a percentage calculated with the formula below:

$$Market\ penetration\ rate\ for\ the\ selected\ technology$$

$$= \left(\frac{Existing\ market\ who\ already\ take\ advantage\ of\ the\ LEME\ equipment}{Total\ existing\ market\ of\ the\ selected\ technology\ regardless\ its\ efficiency}\right)$$

MWH has made assumptions about the market penetration rate for each technology based on experience gained along the TurSEFF first implementation phase and consultation with suppliers. Basic information about highly energy efficient equipment (baseline LEME criteria) versus all equipment sold to the market by suppliers has been collected for all technologies.

The extent to which minimum efficiency performance standards should improve upon industry standards are:

- The minimum performance indicator for a technology with a low market penetration rate (lower than 25%) is set at between 20-25% above the reference baseline.
- The minimum performance indicator for a technology with a market penetration rate at 25% or more in a reference mature market is set at between 25-35% above the reference baseline.

Sub-Task 2.4 - Technology costs

A study has been performed to identify the standard technology costs for each technology. This has been conducted by contacting 3-5 suppliers for each technology and collecting the technology costs for a representative type for each technology (e.g. condensing boiler category – those rated under 500 kW_{th}).

The extent to which minimum efficiency performance standards should improve upon industry standards are:

- If the minimum energy performance indicator is set at a level where the local cost of the technology is within the top 10% of the market costs, the minimum energy performance indicator may be relaxed to accommodate the most expensive 10% of the local market. However energy performance requirements shall not be set lower than 20% above the reference baseline.

Task 3 – Preparation of new LEME table

The previous task has returned the extent (in percentage) to which the performance requirement should go beyond the reference baseline for each technology based on each principle.

Essentially, each technology has been assigned four different percentages. In order to not set too stringent a set minimum performance thresholds which may lead to the rejection of energy efficient equipment, the lowest value have been selected and this percentage has been adopted for estimating the new minimum performance indicators for each technology.

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