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Climate finance needs and respective instruments

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Advanced draft subject to final editing

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Date: 5 March 2014

Ecofys project number: CLIDE14022

DISCLAIMER:
This report was written for European Commission Directorate-General (DG) CLIMA as part of the project titled "Study on Climate Finance – literature review and preliminary analysis of low emission investment plans associated with mitigation pledges made by developing countries in UNFCCC negotiations". The information and views set out in this report are those of the authors and do not necessarily reflect the official opinion of the European Commission.

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1 Introduction

This document presents the Final Report of the "Study on Finance - literature review and preliminary analysis of low emission investment plans associated with mitigation pledged made by developing countries in UNFCCC negotiations" commissioned by DG Climate. It builds on and integrates previous outputs delivered under the project (Interim Report; Case Study Report).

The overall objective of the study is to understand how climate finance and more concretely how different financial instruments can support the mitigation ambitions of developing countries. The study is undertaken in the broader context of developed countries' commitment to jointly mobilise USD 100 billion of international climate finance per year by 2020 to support climate change adaptation and mitigation in developing countries. While financial support has been pledged and partly delivered through multiple channels by the majority of developed countries, it is still not fully understood what financial backing is necessary to bring developing countries on the road to a low emission development and which barriers climate finance can help to overcome.

Against this background the project comprises three steps as shown in Figure 1 below.

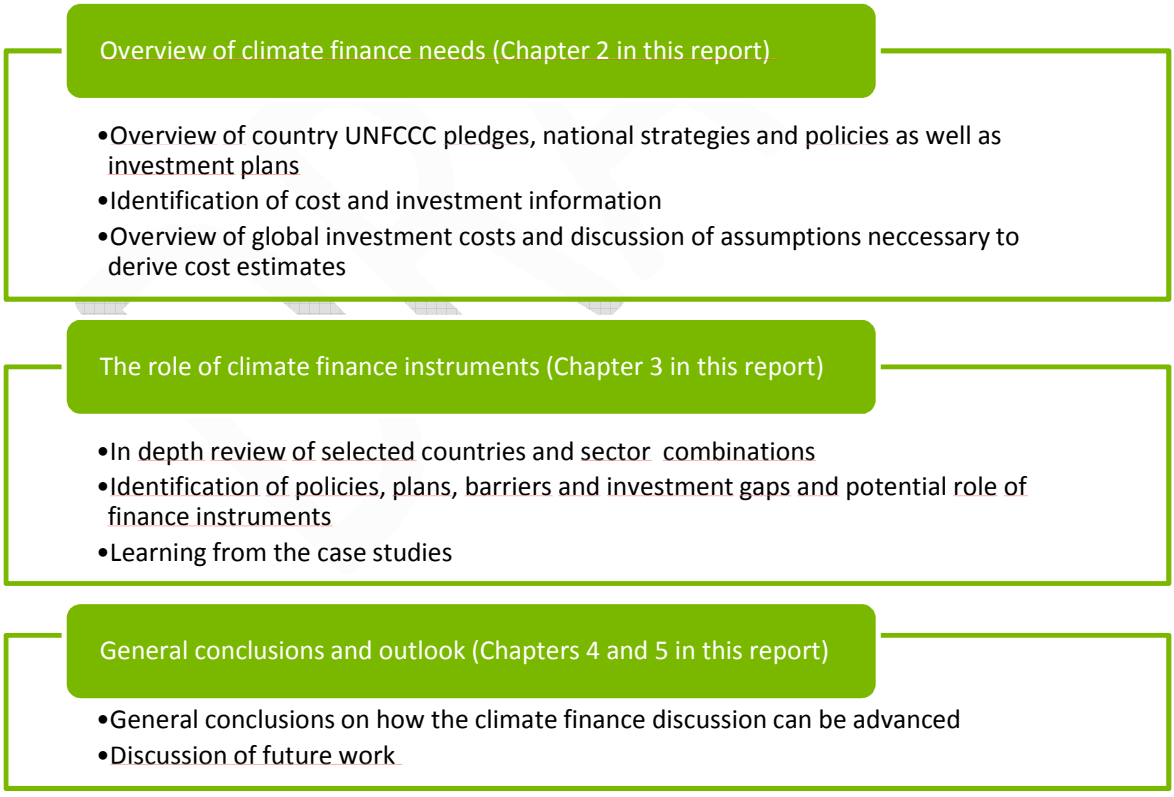


Figure 1: Overview of approach and research questions in this report

First step we provide an overview on country specific finance needs as can be identified in the literature. For that purpose we review a number of national documents including low carbon development strategies and national investment plans. In addition, we provide an overview of approaches to estimate mitigation costs and the assumptions that have to be made in the process as well as a discussion of available global estimates (Chapter 2).

Secondly, we try to approach the question of how finance can best be utilized in the countries by undertaking nine short country case studies. In order to derive comparable results we developed a common methodology for all case studies. This methodology first tries to understand the specific situation in each country by looking at the mitigation potential and potential barriers to implementation as well as how climate finance instruments may help to overcome the identified barriers (Chapter 3).

Finally we draw general conclusions on key aspects in the context of defining climate finance approaches and strategies (Chapter 4) and areas for further research to advance the debate (Chapter 5).

Note the deliverable of step 1 (overview of finance needs) contains a table as well as a report. The table has been delivered separately and is not included in this final report.

2 Identifying climate finance needs

This chapter provides an overview on climate finance needs for global greenhouse gas mitigation. We first provide an overview of existing investment cost estimates on a country level in non-Annex I countries. Given the lack of national estimates we secondly discuss what is required to arrive at national mitigation cost estimates and describe the different cost definitions that exist within the climate mitigation realm. Last but not least we will provide an overview of global studies that estimated incremental investment requirements.

2.1 Existing national investment cost estimates

We performed a mapping exercise to get an overview of national pledges, policies and existing investment plans. The aim was to assess publically available information on the actual climate financing needs required by non-Annex I countries to realise and implement official emission reduction pledges, low emission development strategies and other mitigation activities. The analysis involved a structured literature review of publicly available information and data sources.

2.1.1 Approach

The mapping exercise comprised two steps

- A broad review of relevant national studies to identify whether and to what extent information on costs and required investments is available at country level. This included first a structured overview of what studies are available and secondly an overview on the extent to which they contain cost/ investment data.
- A review of more detailed in-country information including a) details on the pledges b) an overview of relevant policies as available from an internal Ecofys database and c) an overview of investment estimates as provided in investment plans. This information was provided for countries that have a pledge and/or a Climate Investment Plan. The information serves as background information to understand the country specific context better and to support the selection of the case studies.

For the relevant national studies we examined which data was available concerning the financing needs of a country (see Figure 2). Here we distinguished between more general cost information (such as MACC curves) and more short term, investment relevant project specific information.

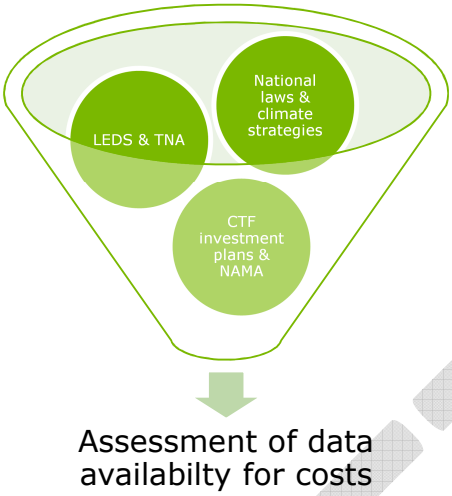


Figure 2 Aspects considered for making cost availability categorization

Data sources that were consulted included the following:

- **Official pledges made to the UNFCCC** by non-Annex I countries following previous work done by Ecofys for the Climate Action Tracker (Climate Action Tracker 2013). Note that only country pledges are included, not pledges made by country groups (e.g. Africa Group pledge).
- **National climate laws and strategies**, of non- Annex I countries as they are a further indicator of the level of commitment to the national policy making process (Dubash et al. 2013)
- **Low Emission Development Strategies (LEDS)** prepared by countries as they are publically available (International Partnership on Mitigation and MRV 2013; Open Energy Information 2013; LEDS Global Partnership 2013).
- **Nationally Appropriate Mitigation Actions (NAMAs)** being planned in the countries, based on the information on NAMAs submitted to the UNFCCC NAMA Registry (UNFCCC 2013a) and activities recorded in the NAMA Database (Ecofys 2013). The NAMA Database (which includes NAMAs submitted to the UNFCCC Registry) currently contains 83 NAMAs and 32 feasibility studies from 34 countries. Most of these are still in the concept stage, meaning that little detailed data (including on cost) is provided. The majority of these NAMAs are policies and strategies (60%) and only 17% are project NAMAs.
- **Technical Needs Assessments (TNAs)** and **Technical Action Plans (TAPs)**, under the UNFCCC where the TAPs, if available, aim at implementing the most promising measures identified by the TNA (UNFCCC 2013b).

- **Climate Investment plans** for the **Clean Technology Fund (CTF)**. Climate investment plans are available for 12 non-Annex I countries[1]. The plans provide the only comprehensive analysis of investment costs for mitigation efforts from a bottom up perspective. We reviewed availability of cost data and expected costs for proposed projects. The cost lists are included in country fact sheets, and the total sum was added to the overview table (see below) (Climate Investment Funds 2013)

Based on the findings from this review and data collection we evaluated the overall data availability for each non-Annex I country with respect to type and amount of information on costs and/or financial requirements. We therefore developed a colour rating as presented in Table 1. The aim of this rating was to identify the countries for which some information on investment or cost data already exist that can be built on. The information was then used as an input for the selection of the case studies (section 3 of this report).

Table 1: Rating of data for costs availability

Colour	Rating	Minimum criteria for rating
	Limited availability	No general cost nor investment cost data found
	Medium data availability	Measure specific general cost data found (e.g. MACC)
	Good data availability	Investment cost data found

The rating above was undertaken on a country by country basis. In order to reach a high rating ("good data availability") some kind of investment data had to be available. Usually this meant that the country either had a CTF investment plan or a Technology Action plan (as part of the TNA assessment) that highlighted future investment needs. If a country only provided cost data estimated on a general level such as in the form of a MACC then we rated the data availability as only medium. Such aggregated cost estimates, that in many cases take a social planning perspective[2], were often provided in LEDS documents or national strategies. If we could not find any relevant cost data in either documents than we rated the data availability as limited.

2.1.2 Results

a) Overview

Key information was gathered from the different documents for all Non-Annex I countries. For each country this includes, where available:

- the mitigation pledge

[1] Note, there are 16 plans in total of which 3 are for Annex I countries (Kazhakstan, Ukraine and Turkey) and one for a region instead of a country (Middle East & North Africa Region). All of these were not included here. Furthermore we did not review SREP investment plans nor other sectoral investment plans such as for forestry as we focused on cross-sectoral data availability

[2] MACC curves for instance often use a "social" discount rate of 4% to reflect that a social planner can take a more long term perspective on investment than private investors.

- national climate laws or strategies
- low emission development strategy (LEDS)
- NAMAs submitted to the UNFCCC
- other NAMA activities and feasibility studies recorded in the NAMA Database
- TNA and TAP documents
- CTF-investment plans

For each of these document types we indicated their availability as well as the extent to which they report cost/ investment information. Table 2 represents an extract of the simplified version of the high level overview table. The full simplified table is provided in the Annex for all examined countries. The table indicates which type of information is available in each of the countries without judgement on quality or importance.

Table 2 Simplified structure of evaluation table

Country	Pledge	National climate law	National climate strategy	LEDS	NAMA	TNA/TAP	Investment Plans -CTF	Summary Cost Availability
Afghanistan	No	No	No	No	No	No	No	
Albania	No	No	No	No	No	No	No	
Algeria	No	No	No	No	Yes (2)	No	No	
Andorra	No	No	No	No	No	No	No	
Angola	No	No	No	No	No	No	No	
Antigua and Barbuda	No	No	No	No	No	Yes	No	
Argentina	No	No	Yes	No	Yes (2)	Yes	No	
Armenia	No	No	No	No	No	Yes	No	
Azerbaijan	No	No	No	No	No	Yes	No	
Bahamas	No	No	No	No	No	No	No	
Bahrain	No	No	No	No	No	No	No	
Bangladesh	No	No	Yes	Yes	No	No	No	
Barbados	No	No	No	No	Yes (1)	No	No	
Belize	No	No	No	No	No	No	No	
Benin	No	No	No	No	No	Yes	No	
Bhutan	Yes	No	No	Yes	No	Yes	No	
Bolivia	No	No	No	No	No	Yes	No	

b) Country fact sheets

Individual country fact sheets were produced for those countries with a pledge and/or an investment plan. These fact sheets go a level deeper providing an overview of the submitted pledge and the emission reductions connected to it in scenarios leading up to 2020, based on analysis from the Climate Action Tracker. This data was then complemented by a list of planned or implemented policies that target mitigation efforts from Ecofys' internal policy database. In a final step the information provided in the CTF investment plans was included in the fact sheet. Each planned project is listed together with the financial support required including a list of potential sources as the

CTF plans aim at a form of mixed financing through grants and loans from local, international as well as bi- and multi-lateral sources.

Of the 152 examined Non-Annex I countries we found that overall 70% of countries show limited data availability when looking at financing requirements for achieving emission reductions as illustrated in Figure 3 below.

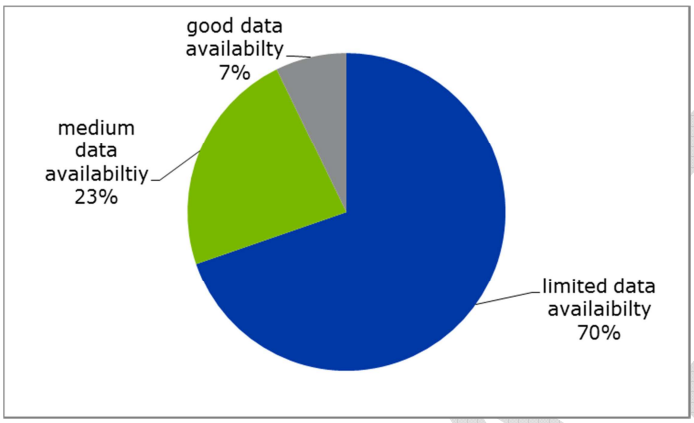


Figure 3 Distribution of data availability across the examined 152 countries

Table 3 provides an overview of the availability of information on different information sources and activities.

Table 3 Number of NA1 countries where information on different types of information is available

Information type	# of countries	# of countries with cost information
Mitigation pledge	14	
National climate laws / strategies	10/29	1
Low emission development strategy (LEDS)	29	9
NAMAs submitted to the UNFCCC	10	10
Other NAMA activities and feasibility studies recorded in the NAMA Database	27	23
TNA and TAP documents	65	43
CTF-investment plans	12	12

The financial requirements reported in the CTF-investment plans examined are shown in Table 4. It is important to highlight that the data has significant limitations and can therefore only be used in an exemplary and illustrative way. Overall the data provided is patchy, assumptions are not clear and time periods are not always provided. This means that the data is not comparable and not suitable for scaling up. Given the incomparability of the country level data a total sum is not provided.

The majority of the proposed projects in the CTF plans fall into the sectors of transport and energy supply, with main subsectors renewable energy and energy efficiency as well as sustainable urban transport. In the plans there is no standardised way of reporting financing requirements according to predefined sectors. Instead reporting is done by providing a list of planned programmes and projects with respect to financing sources, e.g. is the project seeking a loan or grant from a multi-lateral development bank, the private sector or the Clean Technology Fund itself etc. However, it should be noted that some plans do not provide this level of detail and only list general terms like multi-lateral banks or public and private sector as possible sources of financing.

Table 4 Information gathered from the CTF investment plans

Country	Total investment requirement	Type of activities proposed
Chile	US$ 1942 m	Various in Renewable Energy; Energy Efficiency
Colombia	US$ 1363 m	Sustainable Urban Transport; Energy Efficiency; Non-Conventional Renewable Energy
Egypt	US$ 1926 m	Transmission System Upgrade; Wind Farm; Urban Transport
India	US$ 41485 m	Various in Renewable Energy; Energy Efficiency
Indonesia	US$ 5470 m	Various in Renewable Energy, Buildings and Industry
Mexico	US$ 6185 m	Various in Renewable Energy; Buildings; Transport; Energy Efficiency; Industry; Lighting/ Appliances
Morocco	US$ 2166 m	Renewable Energy (Wind Energy Plan)
Nigeria	US$ 1317 m	Various in Transport; Energy Efficiency
Philippines	US$ 2734 m	Various in Renewable Energy; Transport; Energy Efficiency
South Africa	US$ 2350 m	Renewable Energy; Energy Efficiency
Thailand	US$ 2740 m	Renewable Energy
Vietnam	US$ 3070 m	Industrial Energy Efficiency; Urban Transport; Smart Grid Technology; Clean Energy Financing Facility

2.1.3 Conclusions

In the following we present some key conclusions from the literature review related to the pledges and policies, availability and quality of the investment data and information.

Pledges & policies

As the UNEP Emission gap report indicates (UNEP 2013), there is a global gap of 8–12 GtCO2e in 2020 between the currently presented pledges and what is needed to reach a 2 degree scenarios in a

least cost manner. The recent developments in Warsaw have even widened this gap further, as Australia and Japan have decided to step down from their pledge. The climate action tracker (climateactiontracker.org) indicates that only a few, mostly small countries are in the range of what could be considered their fair contribution towards achieving a 2 degree scenario (including Maldives, Costa Rica, Norway, South Korea, Bhutan and Papua New Guinea). Overall almost all countries have to increase their actions tremendously for the world to reach the 2 degree target.

Since Bali (2007) national climate change laws and strategies have experienced a significant increase in Africa, South America and Asia (Dubash et al. 2013). Most countries are in the process of developing first national policies addressing climate issues, using Low Emission Development Strategies (LEDS) as guidance, although LEDS are often high level and do not include detailed data or cost calculations.

General cost information

There are only a limited number of data sources that provide specific cost data, such as for example in the form of MAC curves. Pledges, national laws and LEDS are often lacking this kind of information or only provide it at an aggregated level (e.g. total investment costs as % of GDP).

Investment cost information

Technical Needs Assessments, Technical Action Plans, the CIFs country investment plans or Nationally Appropriate Mitigation Actions are the main source of information for investment costs in countries. Overall only a limited number of countries have a concrete notion of the dimension of required investments. The majority of countries seem to not develop investment estimates when moving forward with climate policy.

The most comprehensive source of bottom up investment estimates are the Climate Investment Plans of the CTF. However, only 12 country plans are currently available for non-Annex I countries, some of which date back to 2009. The investment cost estimates of the CTFs range from US$ 1,316m (Nigeria) to US$ 41,485m (India). Timeframes are typically not provided nor are the bases for the calculations. Sectors include mainly renewable energy, followed by energy efficiency and transport. Projects range from very specific technology and infrastructure investments, to policy reform and capacity building. In some cases the projects (or subsectors) are not specified.

A second good source of information are the Technology Action Plans (TAP) which have been developed for 23 non- Annex I countries. They are often even less comprehensive than the investment plans as they tend to focus on activities such as capacity building, strengthening of institutional set-ups or feasibility studies rather than actual (technology) investment expenses.

Even those centrally organized processes such as the Climate Investment Plans or the Technology Action Plans differ largely in the quality, extent and format of the information provided. They are often very country specific in the way the information is presented. Consequently information on

investment costs is generally not comprehensive and rather scattered focusing on a limited number of projects. Time horizons are also not included. Where investment cost data has been provided it is not always clear how these were calculated and how costs are defined (total costs including investment and O&M, incremental costs only, economy wide costs).

Investment cost data provided for NAMAs is also limited. Except for a small number of detailed NAMA proposals (e.g. Mexico housing NAMA, Chile self-supply renewable energy NAMA), which include detailed cost estimates for specific activities, cost estimates are generally either not provided or very high level estimates. The basis for the calculations and assumptions are often not disclosed.

Generally there are no quality control processes in place for information provided for pledges, NAMAs submitted to the UNFCCC Registry or investment plans, as all of these activities are voluntary and are entirely up to the respective country. In the international process it is recognised that more clarity on pledges and other information needs to be made available to increase transparency and understanding of the adequacy of pledges and action. The agreed International Consultation and Analysis (ICA) process is expected to improve the situation, alongside general reporting guidance.

2.2 Approaches to estimating investment requirements

As the previous section has shown, there is only limited actual data on bottom-up national investment requirements for climate mitigation available. The CTF plans for instance have only been published for a few countries, are often limited in their scope and in some cases outdated. One reason for this lack of data on investment needs is the complexity involved in estimating these. In order to derive such estimates typically a number of assumptions have to be made which lead to a high degree of uncertainty in the outcome.

Here we provide an overview of how such costs are calculated. First we discuss some general considerations that need to be made when trying to estimate investment needs (Section 2.2.1). Secondly we discuss major aspects that influence the resulting estimates. This includes taking a look at different modelling frameworks and their implications (section 2.2.2), as well as discussing the major assumptions that need to be made in such calculations (section 2.2.3). The aim of this exercise is to highlight the sensitivities that are involved in estimating costs. In a last step (section 2.2.4) we will look at existing investment cost ranges to understand the impacts different approaches can have.

2.2.1 General considerations

Financial needs for mitigation can be expressed in various forms. There are three relevant prevailing definitions that have been used repeatedly in literature. These are illustrated in Figure 4.

- *Total investment costs* represent the up-front investment of mitigation projects.
- *Incremental investments* are the difference between the conventional and low carbon investment.

- *Incremental costs* take account of the cash flow over the lifetime and not only the incremental investments.

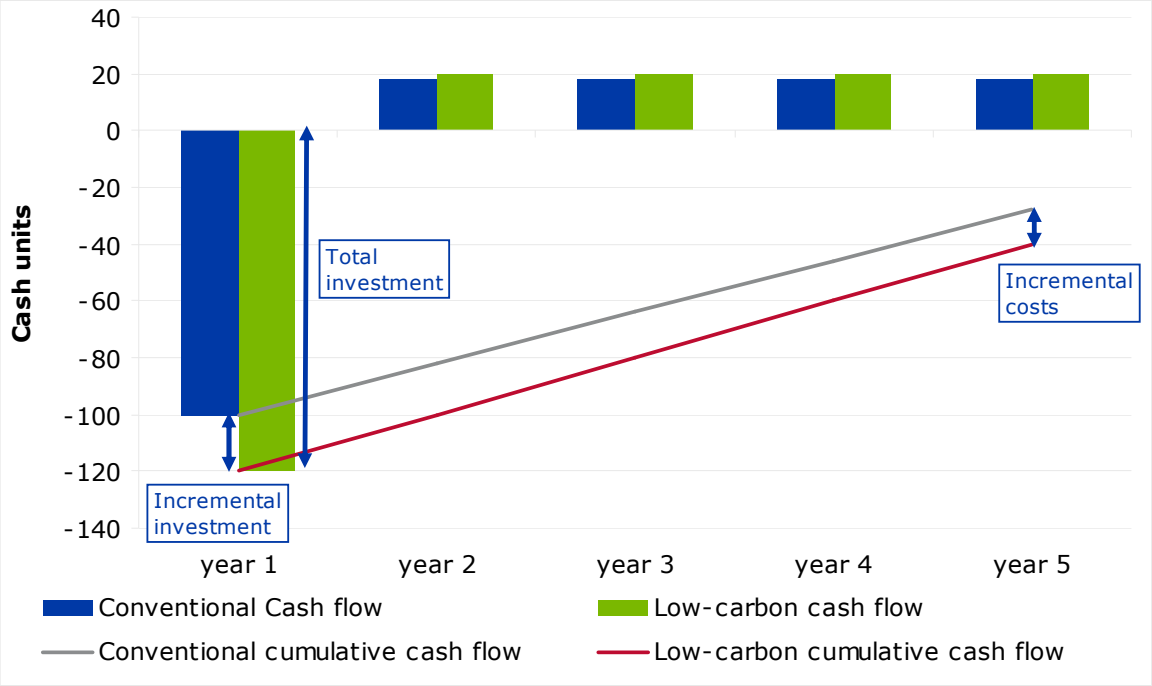


Figure 4: Cost definition for identifying mitigation costs

The figure above illustrates an important consideration in estimating costs: whether only the investment costs at the beginning of a project are considered or the total costs over a project lifetime (i.e. including O&M costs, running costs such as fuel costs and annual revenues). Low carbon technologies tend to have higher initial investment costs than conventional technologies but in turn have lower costs (renewable energy) or higher savings (energy efficiency) over the remaining lifetime. This implies that the incremental up-front investments that will be needed for a shift to low carbon technologies will likely be higher than the incremental costs.

Furthermore, when considering the lifetime costs of a technology, important choices have to be made on the discount rate that is assumed to discount future costs. For example, social planners tend to use low discount rates of 3-4 %, whereas private investors will use much higher discount rates representing their opportunity costs. Furthermore the discount rate might be even higher for low carbon technologies as these are often regarded as high risk investments. Consequently investments that seem attractive from a social planner perspective might not be from a private perspective.

In short, three different perspectives to evaluate costs of mitigation can be distinguished:

- From a ***societal perspective***, discount rates are lower and investments with long time horizons , e.g. investments in energy efficiency that pay back after 10 years, are equally

profitable as investments with a short horizon. Furthermore taxes do not have to be taken into account.

- From a ***project developer's perspective*** discount rates are higher and projects with shorter payback periods are preferred (e.g. 2-3 years for industry). Also taxes have to be considered. From this perspective, some projects are not profitable due to longer payback periods although they are profitable from a societal perspective (e.g. energy efficiency in industry). Other projects on the other hand may be profitable, although they may not be from a societal perspective (e.g. renewable energy for self-supply) because they may save energy taxes and levies for the grid connection.
- The ***climate finance provider's perspective*** (e.g. the Green Climate Fund) needs to look at both: a) the incremental costs from a project developer's perspective to help make the projects profitable, plus b) the costs to make projects that are profitable from a societal perspective also attractive from the private perspective (e.g. through loan guarantees for energy efficiency or by providing loan schemes that help finance the incremental investments costs)

The climate finance provider's perspective is most relevant for the discussion on international climate finance as it describes the amount that governments and other sources have to make available to address the problem of climate change. However, most estimates take the societal and some the project developer's perspective. Estimates taking the perspective of climate finance providers are currently not available, as we will show below.

Estimating the total mitigation costs of a country is a very complex task irrespective of the cost definition applied. First of all assumptions need to be made as to how much mitigation is needed. One could for instance assume a 2 degree pathway broken down to country level using an effort sharing approach. This raises the question of the timeframe. For instance one could only look at a short timeframe of investments, e.g. until 2015, or could take a look at a longer time frame, for example until 2050.

As a general rule, the longer the timeframe the more complex the calculations as the future development of, for example, fuel or technology prices have to be taken into account. However, even a short timeframe will raise questions about which options to prioritise and on what basis certain options are chosen. Choices are based on considerations of costs, co-benefits or the ability to implement the option. In reality, the interests of certain lobby groups may influence which options are chosen first.

All of the above makes estimating mitigation costs a difficult task. Essentially, some kind of modelling framework is needed. Given the complexities involved, the existing frameworks have taken different foci, each with certain advantages and disadvantages as shown below.

2.2.2 Choice of modelling frameworks

A key question concerning the choice of a model is always what factors are assumed to be exogenous to a model (i.e. taken as given) and what factors are endogenous (i.e. part of the modelling). Making factors endogenous to a calculation allows for taking account of interaction between factors such as falling fuel prices due to increased abatement. A basic relationship is thereby, the more a model takes account of factors endogenously the less detailed the model can be on the resolution of technical details: Making factors endogenous to a modelling process requires more complex modelling for which in turn the technical detail of options is reduced.

Table 5: Overview of modelling frameworks that can be used to identifying mitigation costs

Approach	Description and example	Perspective	Advantages	Disadvantages
Marginal Abatement Cost Curve (MACC), measure by measure approach	Measure by measure determination and ranking of abatement cost, often includes expert judgements	Societal or project developers perspective	- detailed measure by measure representation - depicts no-regret options	- lack of systems perspective, i.e. a lot of aspects are regarded as exogenous input to modelling
Energy system modelling (e.g. MARKAL)	Energy systems models are developed for a particular country and model the energy sector in that country. An example is (Kesicki 2013)	Usually societal or sometimes project developer's perspective	- allows to take account of some system wide interaction - some technological details of energy production and consumption technologies	- somewhat limited detail on technology measures (compared to MACC) - cannot take account of more macro-economic feedbacks - assume that all no regret potential is already in the baseline
"Top Down" macro-economic modelling (e.g. CGE)	Macro-economic models account for macro-economic feedbacks, changes in energy demand and shifts in trade	Usually societal perspective	- allows to take account of system wide feedbacks	- very limited detail on technology measures - assume that all no regret potential is already in the baseline

As Table 5 shows existing models tend to mainly take the societal perspective, i.e. answering the questions of policy makers. Sometimes the perspective of the project developer is also taken into account. However there is literally no model that estimates the costs from the perspective of the climate finance provider.

2.2.3 Factors that influence determination of mitigation cost

In the calculation of mitigation costs a number of factors play an important role and can vary the outcome of the calculations significantly. Some of the most important ones, as well as their relevance for different types of cost estimations, are presented in the table below.

Table 6: Factors influencing the calculation of mitigation costs

Aspect	Description	Total investment cost	Incremental investment	Incremental cost
Perspective	Three perspectives can be distinguished as mentioned above: Social planner perspective, (private) project developer perspective, and climate finance provider's perspective. Depending on the perspective taken different assumptions have to be made on some of the aspects described below.	X	X	X
System boundary	The choice of boundary can have important implications for the cost estimation. For instance, an estimate could include only the cost of technology production (e.g. wind turbine) or alternatively could also include other costs (e.g. siting costs, grid connection costs).	X	X	X
Year of cost data	The year of the cost influences the calculation in 2 ways - inflation - changes in the costs, e.g. cause by so called learning effects.	X	X	X
Discount rate	Social and private discount rates reflect the different perspectives taken. Furthermore, discount rates can differ significantly by sector and/or technology depending on factors such as the risks encountered in the particular situation. Common social discount rates are app. 4% and for private investors between 8% and 15% or even higher.			X
Lifetime	The assumed lifetime of a technology is an important factor for estimating lifetime costs. One can assume the technical or economic lifetime. The economic lifetime can differ largely between regions, for instance a power plant in the USA runs much longer than in Europe.			X
Operational costs (especially fuel costs)	Conventional technologies tend to have much higher fuel costs than low carbon technologies, and energy savings generate revenues for energy efficiency. Hence it is important to consider energy prices. Energy prices differ by region and sector. While the major fuels are internationally traded commodities and prices are quite comparable across regions, there still may be differences depending on local availability of resources; the retail prices for electricity differs heavily by country depending on the energy mix in that country, local pricing regimes and the application of subsidies and taxes. Further complications are added when considering the future development of energy prices which involve large degrees of uncertainty.			X
Reference technology	An appropriate reference technology or set of reference technologies need to be chosen. Investment cost and technological characteristics of the reference technology can differ largely depending on the technology chose and have a large impact on the incremental investment and cost of the low carbon technology.		X	X
Learning / economies of scale / Market maturity of	Mitigation technologies are often in earlier stages in the development. That means that their costs will likely decrease heavily (see solar PV) due to technological learning and economies of scale.	X	X	X

Aspect	Description	Total investment cost	Incremental investment	Incremental cost
technology				
Regional differences	Regional differences in cost estimates can be caused by differences in labour costs or other factors that influence countries' specific cost structures. Regional cost differences can also occur due to differences in the potential (e.g. the renewable energy potential) and the particular climate conditions (e.g. heat degree days in the buildings sector or climatic zones in the AFOLU sector).	X	X	X
Site specific conditions	Investment costs are site specific and can vary largely depending on the sites accessibility and other site specific characteristics.	X	X	X
Additional investment costs not directly related to the mitigation technology	Moving to a sustainable world requires (energy) system level changes and investments. These could include infrastructure investment in transport infrastructure (rail) or the electricity grid.	X	X	X
Country or technology specific risk profiles	Investment mark-ups could be added for country or technology specific risk profiles.	X	X	X

Given that assumptions are often used, cost estimations should be accompanied by an uncertainty analysis which allows variation of key parameters within a reasonable range. For a project by project analysis the input range of parameters will be smaller than for a country wide modelling exercise that has to take account of larger uncertainty ranges of input parameters. For instance site specific assumptions such as wind speed but also investment costs can be estimated with much greater certainty on a site by site basis than in aggregated model environments that do not have site specific details. Hence larger uncertainty ranges need to be used to take account of all possible site specific situations in order to arrive at realistic cost estimates.

2.2.4 Exemplary modelling outputs

(Olbrisch et al. 2011) have summarized a number of country studies estimating incremental investment costs as defined above (Table 7).

Table 7: Country study estimate for the calculation of incremental investment costs (Source: adapted after Olbrisch et al. 2011)

Country	Source 1: World Bank Low Carbon Growth studies		Source 2: World Energy Outlook 2009		Source 3: Project Catalyst, facilitated by McKinsey & Company	
	Time period	Estimate	Time period	Estimate	Time period	Estimate
China	2010–2030		2021–2030	167 billion USD	2010–2030	150–200 billion €
India	2010 - 2030	60 billion USD	2021–2030	49 billion USD		
Mexico	2008–2030	3 billion USD			2011 - 2030	25.2 billion USD

The numbers illustrate the difference in estimates depending on:

- Time period – What time period is considered in the calculations?
- Approach and assumptions on modelling – What model was used? What technology options are considered? What assumptions are made on the cost estimates? Which scenarios are used? (see also section 2.2.3 and 2.2.4)

The case of Mexico illustrates the difference these assumptions can make as the numbers differ almost by a factor of 10. Such variations illustrate the uncertainties associated with calculating estimates and put the usefulness of the results in question. There is more convergence on estimates for India and China, whereby China accounts for approximately 45% and India for approximately 13% of additional investment costs in developing countries in the studies examined (Olbrisch et al. 2011).

2.3 Estimates of global investment requirements

A number of studies have identified global incremental requirements for climate change mitigation:

- The IEA has published an estimate in its World Energy outlook in 2009 (OECD and IEA 2009), which was updated in the Energy Technology Perspectives report in 2012 (IEA 2012).
- McKinsey has estimated incremental investment requirements based on abatement cost curves (McKinsey & Company 2009)
- The UNFCCC secretariat published a technical paper on "Investment and financial flows relevant to the development of an effective and appropriate international response to Climate Change" in 2007 (UNFCCC 2007) and an update in 2008 (UNFCCC 2008) .

Olbrisch et al. (2011) provide a comprehensive review of the different studies. Below we provide an overview of the results of the different studies (2.3.1) followed by a discussion of the assumptions that were made in each study (2.3.2), highlighting where the differences in results might come from.

2.3.1 Comparison of results of different studies

The results of the estimates given in literature vary significantly. Table 8 illustrates the resulting numbers for required investments per sector in 2030.

The investment requirements from the studies vary between 200 to more than 1200 billion USD in 2030. All sectors show significant variation. Of the three studies, only the UNFCCC study includes negative investment needs (for reduced investments in electricity generation based on fossils and fossil fuel supply due to electricity savings in demand sectors). The UNFCCC study also illustrates additional investment needs for technology research, development and deployment.

Table 8: Studies on global incremental investment requirements – comparison of investment requirements in 2030 per sector

Sector	IEA[1)]	McKinsey[2)]	UNFCCC[3)]
Total	**800 billion USD**	**1215 billion USD**	**200 – 210 billion USD**
Power supply	200 billion USD	222 billion USD	-7 billion USD[4)]
Industry	50 billion USD	182 billion USD	37 billion USD
Transport	300 billion USD	450 billion USD	88 billion USD
Buildings	250 billion USD	297 billion USD	51 billion USD
AFOLU	-	65 billion USD	56 billion USD
Others			Technology research, development and deployment: 35-45 billion USD Fossil fuel supply: -59 billion USD

Notes:
[1)] Numbers adapted from original value: Accumulated 2020-2030 divided by 10 to calculate annual average. Assumption: Monetary value expressed in current year USD (2012).
[2)] Numbers adapted from original value: Accumulated 2026-2030 divided by 5 to calculate annual average, converted from € to USD with factor 1.5 (1€ = 1.5 USD). Assumption: Monetary value expressed in current year USD (2009).
[3)] Monetary value expressed in 2005 USD.
[4)] Combines decrease in investments in fossil fuel fired electricity supply due to achieved energy savings in other sectors (-155 billion USD) and incremental investments in low-carbon technologies (148.5 billion USD)

2.3.2 Discussion of assumptions and uncertainties in the studies

The studies summarized above show large discrepancies in the overall investments required. These can to a large part be attributed to the assumptions made in the studies and the approaches chosen (see Section 2.1). Table 9 compares the underlying assumptions made in the reports. Each of those has implications on the results, as described below.

Table 9: Studies on global investment requirements – underlying assumptions

Study name	Year	Approach to estimating investment	Scope of mitigation activities considered	Remaining emission level after mitigation in 2030 [GtCO2e/a]	Business as usual emission level in 2030 [GtCO2e/a]	Time period considered for investments
IEA, Energy Technology Perspectives	2012	IEA global energy model	Energy related CO2	26[1)]	45[1)]	Accumulated over 2020-2030
McKinsey, Pathways to a Low-Carbon Economy	2009	MACC based	All sectors	32	70	Average over 2026-2030
UNFCCC, Investment and financial flows to address climate change: an update	2008	Aggregation of external scenarios and party submissions	All sectors	29	62	2030 value

Notes:
[1)] Only energy related CO_2 emissions

Year of the study

The year of publication influences the cost assumptions and has implications on the monetary value. On the one hand technology costs may decrease over time due to technological learning. On the other hand inflation plays an important role. Olbrisch et al. (2011) for example show that the IEA estimates of 808 billion (2008) USD would decrease by 50 billion USD if they were expressed in billion (2005) USD, used for the UNFCCC data.

Modelling frameworks

The studies included here make use of three different approaches. While McKinsey based its analysis on static MACC, IEA works with a more dynamic bottom up energy model. The UNFCCC study aggregates existing information. The resulting effects of the choice of modelling framework are difficult to estimate but are likely to be significant. It is interesting to note here that the MACC approach is not able to take account of feedback loops, especially the reduced need for investments in power plants due to energy efficiency improvements on the demand side. This will lead to higher cost estimates than in the other models.

Scope of mitigation actions considered

While the UNFCCC and the McKinsey studies both take into account all sectors and gases, the IEA study focuses on energy related CO_2 emissions, i.e. Incremental investment requirements for non-CO_2 gases are not taken into account. Some sectors are excluded completely, such as waste, agriculture and Land Use, Land Use Change and Forestry (LULUCF). Furthermore it is unclear whether the same mitigation options were considered for the energy sector in all models or whether in any of the models certain mitigation options were excluded.

Emission pathway chosen – Business as usual and expected remaining emissions

The studies use different business as usual scenarios and assume different mitigation levels in 2030. As a result, the efforts needed vary and therefore the required investments, which are not necessarily proportional to the reduced emissions. The reductions are highest in the McKinsey scenario, which may be one reason why estimated investment requirements are highest here.

Time period for investments requirements

The UNFCCC study illustrates the numbers as an annual value in one year. McKinsey introduces an average annual value over 5 years, and IEA an accumulated number over 10 years. The numbers which cover various years cannot directly be compared, as investment requirements change over the years. The IEA scenario for example shows higher values for the time period of 2030-2040 than for 2020-2030, and it is unlikely that this is a step change from one year to the other.

3 The role of climate finance instruments

In this section we present the results of the case study analysis we undertook for nine sector/ country combinations. The analysis had two main objectives:

- to identify where and how international climate finance can support the selected case studies to move towards low carbon choices and achieve national mitigation objectives;
- to provide insights that can be scaled up to get a broader understanding of investment needs and solutions on the global level and the role of international climate finance.

Below we first provide an outline of the methodology applied (Section 3.1), followed by summaries for each case study country in a factsheet format (Section 3.2 and Section 3.3). Finally we provide the major findings from the case studies (Section 3.4).

3.1 Methodology

In a first step we selected a number of countries and two sectors. The criteria for country selection were the following:

- Data availability (especially with regard to information on investment needs) and level of activity: input from Task 1 as well as expert knowledge Ecofys
- Balance across country groupings as represented in the UNFCCC context :one country each from Least Developed Countries and Small Island States, emerging economies, other developing countries
- Regional balance: one country each from Latin America, Asia, Africa

Second we decided on which sectors to look at. After consultation with the client we decided on renewable energy in the power sector (i.e. for electricity production) and energy efficiency measures in the buildings sector. The selected country sector combinations are shown in Table 10.

Table 10: Overview of selected country and sector combinations for the case study

Country	Country grouping[3]	Region	Sector
Chile	Emerging economies	Asia	RE in the power sector
Ethiopia	Least developed country	Latin America	RE in the power sector
Indonesia	Other developing countries	Africa	RE in the power sector
Samoa	Small island state	Africa	RE in the power sector
South Africa	Emerging economies	Asia	RE in the power sector
Bangladesh	Least developed country	Asia	EE in the building sector
China	Emerging economies	Latin America	EE in the building sector
Mexico	Emerging economies	Asia	EE in the building sector
Philippines	Other developing countries	Asia	EE in the building sector

The sectors and associated technologies are defined in more detail in the table below.

Table 11: Overview of potential technologies to be reviewed per case study

Case study sector	Potential technologies to be reviewed
RE in the energy sector	Hydro power, Wind power, Solar energy, Geothermal energy, bioenergy, waste to energy
EE in the building sector	Low and very low (passive standard) building envelope measures, appliances (especially lighting, air conditioning units/ chillers, TV, etc.)

The focus on two specific sectors and associated technologies will increase the relevance of the case studies and the potential for drawing conclusions which can be extrapolated to other countries with similar conditions.

3.1.1 Case study analysis

General considerations

One of the key aims of the study is to get an understanding of the scale of finance required to achieve mitigation objectives in developing countries. The initial literature review concluded that little reliable data on investment needs is currently available at the national (i.e. bottom up level). A

3 Least developed countries as defined by the UN for 2013: http://data.worldbank.org/region/LDC

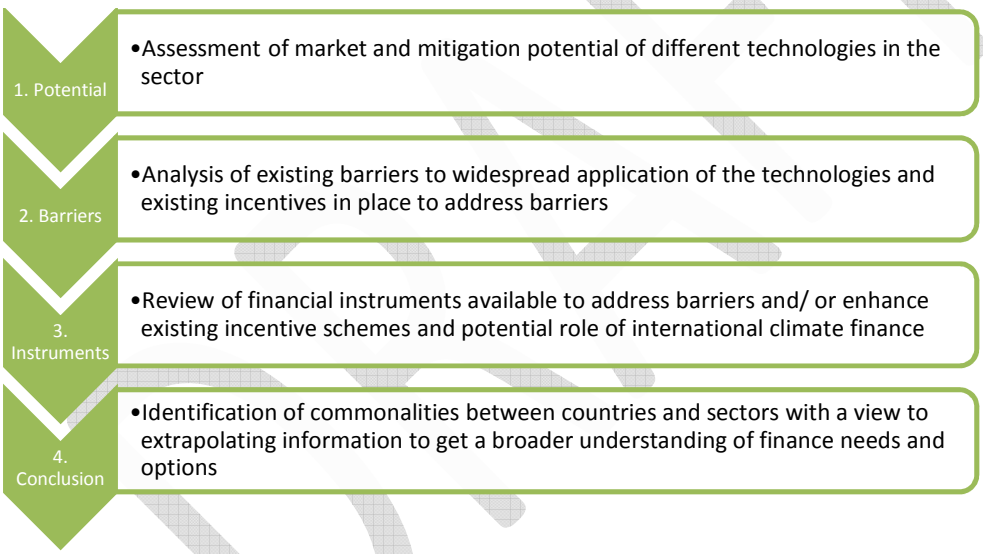
robust estimation of finance needs would require a deep understanding of specific national political and market contexts which in turn requires a level of effort which is beyond the scope and purpose of this study.

To understand investment needs and the role of international finance it is necessary to understand existing barriers. Hence the analysis of the case studies focuses on barriers and how these can be addressed by financial instruments.

Wherever possible we used quantified information and data . However, the majority of the analysis is qualitative in nature.

Overview of approach

For each case study three analytical steps were undertaken. This was followed by a fourth step to draw out common aspects in step 3 of the climate finance study (not part of this report):



For the analysis we developed **common checklists** for each step based on best practice literature. The checklist approach allows for comparability across countries which in turn allows to draw generalizable conclusions and identify patterns across countries and sectors. The checklists will also provide a replicable methodology which may be used in other country contexts. For each step they are presented below.

Further details on the key aspects that were considered for each of the three steps are provided in the following.

1. Market and mitigation potential

Description

Qualitative, order of magnitude analysis of main foci of case study countries based on market and mitigation potential; the aim is to identify areas/ technologies within the country that are especially promising with regards to mitigation in the future.

Approach and data sources

In a first step we reviewed the existing national literature on mitigation potential for each case study country. Based on this we provided a qualitative description of the following aspects for each technology:

- Mitigation potential – Given the situation in the country, what potential does the technology have?
- National relevance – To which extend is the technology prioritized by national planning?
- Economic feasibility – Given the situation in the country and the overall feasibility of the technology, how expensive will it be to implement the technology?

We provided a score for each aspect together with an aggregated score for each technology. Please note that the aggregated score is not the average or sum of the individual scores but instead is scored separately, as an automatized aggregation would require further assumptions that are difficult to make.

In addition to the potential we provide an indication of the market maturity of each technology in a particular country using following approach:

- for RE in the electricity sector: We identified the current share in the energy mix of RE sources as well as the number of patents filed for each technology (if available)
- for EE in the building sector: We identified to what extent a building code has been implemented, whether standards for appliances exist and whether the country has a green certificate scheme for buildings

Table 12: Checklist for mitigation potential and implementation to date

Aspect	Analytical questions for renewable electricity production	Analytical questions for energy efficiency in buildings
Quantitative analysis of potential	Are there any existing studies in the country that have quantified the potential per technology?	
Qualitative analysis of potential	What is the mitigation potential in qualitative terms? Base this on the existing quantitative estimates where available. For each technology consider the mitigation potential, national relevance and the economic feasibility.	
Implementation to date	What is the share of RE in the current energy mix? How many patents have been filed within the country for each technology?	Is a building code in place? Is the building code enforced? Are there standards for appliances? Are there green certificates issued in the country? If so how many?

2. Evaluation of barriers and incentives

Description

The aim is to identify barriers and incentives that currently exist for each case study. It is also important here to identify which barriers may be addressed by different international climate finance instruments (e.g. capacity building grants or loans).

Approach and data sources

Two checklists, one for barriers and one for policies, were developed for each sector (i.e. for EE in buildings and RE in electricity). These checklists include commonly identified barriers as reported in the literature.

Each case study was evaluated against the checklist. Information was drawn from available literature and our internal knowledge from on-going projects in the respective countries. Where country specific barriers are difficult to identify assumptions on common barriers, for example based on the general country profiles, were made.

Table 13 presents a checklist of barrier categories which were considered. For both sectors we identified a number of common barriers for each category.

Table 13: Checklist of barrier categories and common technology specific barriers

Barrier categories	Common barriers included for renewable electricity production	Common barriers included for building energy efficiency
Institutional/ political	• Unclear procedures and/or complex interactions and lack of coordination between the various authorities involved • General administrative environment is not conducive to change • "Technology standards are lacking for (some) renewable energy technologies and fuels" • Weak network between parties involved within the country • Long lead times to obtain the necessary permits, both with respect to approvals and to complaints procedures. • Reactive or counteractive rather than proactive authorities	• Unclear procedures and/or complex interactions and lack of coordination between the various authorities involved • General administrative environment is not conducive to change • "Technology standards are lacking for (some) • energy efficiency technologies" • Weak network between parties involved within the country • Lack of enforcement of existing building codes or standards
Financial/economic	• Lack of availability of affordable cost-of-capital finance to project developers/end users. • Lack of Investment & implementation strategy for RE oriented grid structures • High upfront investment costs for RE compared to other conventional sources /current energy mix • Finance is unreasonably costly for renewable energy • "Import tariffs and technical barriers impede trade in • renewables"	• Lack of availability of affordable cost-of-capital finance to project developers/end users. • Price distortion: individual energy costs and societal costs do not match up; reducing energy costs has low priority compared to other costs • Imperfect information: e.g. consumers are poorly informed about market conditions, technology characteristics and their own energy use • Split-incentives: the building owner is not necessarily paying the energy bill • High upfront investment costs for EE compared to other

Barrier categories	Common barriers included for renewable electricity production	Common barriers included for building energy efficiency
		options • Small size of EE projects in buildings sector • Uncertainty with regard to long-term energy savings
Technical	• Immature/ unproven technology in the country (technology new to the country) • Lacking procedures to deal with environmental impacts	
Informational/ capacities	• Absence of spatial plans by the time of development of a project • "Renewable energy skills and awareness are "insufficient"	• Energy efficiency skills and awareness are insufficient • Lack of information may lead to cost-effective energy efficiency measures opportunities being missed
Social, cultural and behavioural	• Lack of Social acceptance: "Not in my backyard" issues (real or perceived annoyances), unfamiliarity with RETs • Lack of experience with local involvement	• Misconception that energy efficiency measures and cultural way of building cannot be combined • Significance of efficient energy management and energy savings is low

3. Identification of financial instruments

Description

After identification of barriers and policies in the countries the aim here is to identify whether and how (international) climate finance instruments can support the technology option and provide incentives to overcome existing barriers.

Approach

Similar to previous steps we developed a list of potential financial instruments. For each identified barrier we reviewed what role these financial instruments could play in overcoming the barrier. In addition we also briefly mention other interventions that might be undertake in addition or instead of

the financial instruments. This allows to get an overview of where financial instruments can play a role in overcoming important barriers. In addition it highlights areas where financial instruments might not be the most appropriate interventions, such as is the case where there is a lack of capacity or institutional frameworks.

Table 14 presents an overview of the financial and economic instrument types that we considered and how we defined them for the purpose of this study.

Table 14: Checklist of financial economic instruments

Financial and economic instrument	Definition of instrument as applied for this study	Examples
Equity	Input of capital contributions that is converted to an ownership share in the project activity.	• Balance sheet financing • Project-level equity
Loans	Financing secured through borrowing money at a given rate over a given period of time. The lender has no share in the project but instead is only interested in the return of the investment . Loans can be provided at market rate through financial institutions or below market rate subsidised by the government.	• Zero interest loans; • Low-cost loans; • Micro-finance; • Provision of assets/technology. • Cash loans; • Technology/assets obtained on finance;
Guarantees	Guarantees are a risk management tool provided by the public sector to reduce project risks. They promise to pay an amount of fund based on certain conditional. They can remove many risk-related barriers to investment, as they can mitigate a large number of risks including non-payment, poor technological performance, poor market performance, or non-fulfilment of contractual obligation from wither governments or private entities.	• Guarantees
Policy incentives	Mechanisms, normally implemented at the domestic level, that provide financial incentives or create a market for transactions for certain desired outcomes.	• Fiscal/financial incentives such as subsidies, CO2 taxes, energy and other taxes, Feed-in tariffs/premiums

Financial and economic instrument	Definition of instrument as applied for this study	Examples
		• Market-based instruments such as GHG emission allowances, green certificates or white certificates
Grants	Non-repayable funds disbursed by a governmental or regional entity conditional upon certain qualifications as to their use or maintenance of specified standards.	• Technology grant scheme
Non-finance interventions	All other interventions that are not covered by the instruments above	• Capacity building • Institutional support • Regulatory change • R&D • International technology platforms

4. Summary per case study

This report includes a summary of each of the case study countries in a factsheet format. In the subsequent analysis the case study outputs were used to draw out conclusions and findings at the higher, meta level including the identification of commonalities (and differences) between countries and sectors. The aim was to extrapolate information to understand finance needs and options on a broader, global scale.

3.2 Country factsheets renewable energy in the electricity sector

3.2.1 Chile

Country: Chile		Sector: RE in electricity
General indicators[4]		
Credit rating	AA- (S&P)	**Country profile summary:** Chile is an emerging economy which has experienced strong economic growth and development in the past decade. The country is a member of the OECD since 2012 and aims for developed country status by 2020. In terms of climate policy the country continues to be an active player and a leader in the region. Chile has a fully liberalised energy market and the private sector investment climate is very good.
Competitive index	4.61 (34/152)	
Transparency index	71 (22/175)	
HDI 2012	0.82 (40/187)	
National mitigation potential and implementation to date		
Overall score	high	**Summary potential:** Chile has very good resources and conditions for the potential generation of renewable energy. The country's long coastline provides ample opportunities for wave and wind energy, whilst the north of the country is exposed to one of the highest irradiation rates in the world, giving potential for up to 228 GW of solar energy. Relatively high energy costs across the country increase the cost-effectiveness of renewable technologies, and their potential scale of use may further increase the economic feasibility.
Wave	high	
Solar	high	
Wind	Medium	
Hydro	Medium	**Summary Implementation to date:** In 2013 non-conventional renewable energy represented just over 6% of the total capacity. Capacity has been increasing steadily however still falls well short of the identified potential across many technology areas. There is a nascent technology and services industry. The solar energy market presents the biggest scope for growth given the high potential and relatively little development in the sector to date.
Biogas	Medium	
Landfill Gas	medium	
Geothermal	High	
Barriers and Policies: Scoring: 1 = low/insignificant barrier, 4 = severe barrier		
Barrier Category	**Score**	**Summary**

[4] For all case studies the following sources were used for the general indicators. Credit Rating, Standard & Poor's ratings mainly 2013. Competitiveness: http://www.weforum.org/reports/global-competitiveness-report-2013-2014; Transparency: http://cpi.transparency.org/cpi2013/results/; UN Human Development Index (HDI) 2012.

Institutional/political	2.5	Obtaining permits especially for smaller projects can be problematic.
Financial/economic	2.4	Financial barriers mainly relate to a lack of experience with project finance for RE causing some difficulties for investors to obtain finance. Highly fluctuating electricity prices and the lack of long term price signal can also be problematic. Many technologies are cost competitive in Chile as electricity prices are high, however, RE investments compete with other investment choices which may present better risk reward ratios. Investment in grid infrastructure suitable for RE at scale is needed.
Technical	2.8	Lack of experience with RE technologies and few reference projects. Lack of environmental criteria especially for hydro, geothermal projects and CSP can be a problem, as well as a flexible grid structure with access to remoter regions (with high RE potential).
Informational/capa-cities	3.3	Lack of knowledge and awareness as well as a lack of technical capacity and ancillary service offer is a key barrier to RE deployment at scale. This applies to all technology areas.
Social, cultural and behavioural	2	Unfamiliarity with technologies and high perception of risk among all stakeholders.

Policies summary: There are several policies in place to support renewable energy, mainly a RE quota for electricity distribution companies and a public bidding mechanism for RE projects with targeted incentives per technology type. Certain tax benefits are also in place. The national agency to support private sector development (CORFO) runs various support schemes and is planning to set up an incentive scheme for self-supply renewable energy (supported by international NAMA finance).

Matching barriers with financial instruments

Financial instrument	Institutional/ political	Financial/economic	Technical	Informational/ capacities	Social, cultural and behavioural
Equity		Private/ public equity for lower risk technologies (wind, solar, bio)	Private / public equity for investment in grid infrastructure		
Loans		Esp. low cost loan schemes will provide investment incentive; preferential loan schemes planned.	Low cost loans for investment in grid infrastructure		

Guarantees		Suitable to improve access to finance esp. for higher risk projects/ technologies; guarantee fund currently planned. Price stabilisation fund was considered but not pursued			
Policy incentives	Policy incentives can have indirect effects to a more conducive institutional and political environment	Tender scheme could be up-scaled if proving successful		Policy incentives can have indirect effect to develop wider capacities	
Grants		Can provide additional incentive for less mature technologies; relevant for project development phase (feasibility studies)			
Non-finance interventions	Capacity building Regulatory change Awareness raising	Capacity building (finance sector) Regulatory change	Regulatory change R&D Awareness/ demonstration	Capacity building Awareness raising	Institutional change Policy change Awareness raising
Summary : The main barrier to RE development and investment in Chile are information and capacity barriers mainly related to a general lack					

of experience with and confidence in RE technologies but also more specifically to a lack of sufficiently qualified technical services. Finance barriers have also been identified, although these again relate to a lack of experience with RE finance in the commercial banking sector as well as a lack of long term price signals. Finance instruments can be appropriate to improve finance conditions for RE investors, in form of guarantees or low cost loans as well as to support longer term investment in the expansion of the grid infrastructure.

3.2.2 Ethiopia

Country: Ethiopia		Sector: RE in electricity
General indicators		
Credit rating	BBB- (Dagong/ China)	**Country profile summary:** Ethiopia is a least developed country with strong ambition to move to middle income status by 2020 as evidenced in the country's green growth strategy (CRSGE). A key challenge for the energy sector is suppressed demand as many parts of the population have no access to electricity. In addition, increasing droughts present a problem to long term stable supply as hydropower is the main source of energy.
Competitive index	3.50 (127/148)	
Transparency index	33 (111/175)	
HDI 2012	0.39 (173/ 187)	
National mitigation potential and implementation to date		
Overall score	high	**Summary potential:** The potential for RE energy is high**.** Hydro power has significant potential in Ethiopia and is central to the government's plans for the growth of the energy sector. There is also significant exploitable reserve of wind power. Ethiopia's RE energy potential comes at a low cost per kwh, but requires very large start-up costs for construction and infrastructure.
Wave	n.a.	
Solar	medium	
Wind	high	
Hydro	high	**Summary implementation to date:** Ethiopia's energy supply consists mainly of hydro power (99%), geothermal energy is of increasing importance. Recently a few wind power projects have been planned and are currently implemented. Overall Ethiopia is a highly RE focused country albeit little to no industry seems to exist to support this (all technology seems to be imported).
Biogas	low/medium	
Landfill Gas	low/medium	
Geothermal	high	

Barriers and Policies: Scoring: 1 = low/insignificant barrier, 4 = severe barrier

Barrier Category	Score	Summary
Institutional/political	2.0	Generally a conducive environment for RE as already now they play a significant role in the country; however permitting processes are long and for many technologies standards are lacking. Access for independent power producers is difficult.
Financial/economic	3.4	Grid access is very low (23%) and large investment is needed to provide rural areas with access to electricity. In comparison to many other countries RE energy is regarded a cost effective form of energy, however the required up front investments still pose a challenge. Access to finance is difficult for private investors.
Technical	3.0	Hydropower is proven in the country, however other technologies are not. There is limited experience especially with rural (off-grid) electrification. Environmental impact assessments –

		which are particular relevant for hydro projects - tend to be weak; frequent droughts cause outages due to hydropower dependency of the system.
Informational/capa-cities	3.5	Human capacity across all technology areas is generally very low. There is no active and thriving private sector in the country.
Social, cultural and behavioural	2.0	General acceptance in the public is high, however there is a lack of experience with local involvement especially in rural areas with respect to electricity production
Policies summary: Ethiopia has a comprehensive green growth strategy which includes RE targets. Current expansion of RE is largely donor driven and funded. There are no specific incentive schemes in place to promote renewable energy on a wider scale. A feed in tariff is being considered, however its stringency is unclear.		

Matching barriers with financial instruments

Financial instrument	**Institutional/ political**	**Financial/economic**	**Technical**	**Informational /capacities**	**Social, cultural and behavioural**
Equity		Equity for large scale projects	Public equity for infrastructure investment		
Loans		Esp. low cost loan schemes will provide investment incentive; however access to market for IPPs needs to be improved	Loan scheme for less known but low risk technologies. However private sector needs to be developed.		
Guarantees		Generally suitable to improve access to finance esp. for higher risk projects/ technologies. However private sector is undeveloped and therefore not an option on its own.			

Policy incentives	Policy incentives can have indirect effects	Economic incentive schemes to boost investment esp. in off grid technologies. Private sector needs to be strengthened.		Policy incentives can have indirect effect to develop wider capacities	
Grants	Not appropriate	Can provide additional incentive for less mature technologies; relevant for project development phase (feasibility studies). Also for small scale off grid solutions.	Grant scheme for smaller scale technologies/ investments		
Non-finance interventions	Capacity building Regulatory change Awareness raising	Capacity building Regulatory change	Regulatory change R&D Demonstration projects	Capacity building Awareness raising	Awareness, capacity building, policy change

Summary :

As a least developed country Ethiopia faces multiple challenges with regards to RE energy development. A low electrification rate and inadequate power infrastructure are key issues. Significant barriers exist on the financial, technical and capacity levels. Continued donor led finance and investment in energy can support RE development and especially the required investment in access to electricity, however deeper structural change is required for a longer term transition of the sector. In particular the development of an environment conducive to private sector investment, e.g. through policy incentives, regulatory change as well as capacity building, is needed.

3.2.3 Indonesia

Country: Indonesia		Sector: RE in electricity
General indicators		
Credit rating	BB+ (S&P)	**Country profile summary:** Indonesia is a middle income country which has seen significant growth in recent years and is one of the key powers in the region. The country has significant fossil fuel resources, including coal, oil and gas, and is increasingly redirecting energy exports to cover its own growing domestic consumption. Indonesia has been a proactive player in the climate policy debate and has put forward ambitious mitigation targets. Apart from energy, the forestry sector is of key importance.
Competitive index	4.53 (38/148)	
Transparency index	32 (114/175)	
HDI 2012	0.63 (121/187)	
National mitigation potential and implementation to date		
Overall score	medium-high	**Summary potential:** Indonesia is endowed with natural resources and conditions that provide very high potential for renewable energy, in particular hydro. With a coastline of thousands of kilometres, wave energy might have huge potential, although the technology is unproven. Solar potential has not been thoroughly investigated due to assumptions that it is prohibitively expensive but is estimated to be high. Biomass also represents large potential, although is currently somewhat restricted to off-grid solutions due to the costs of transporting biomass from remote areas of the country.
Wave	unknown	
Solar	high	
Wind	medium	
Hydro	high	**Summary implementation to date:** Whilst hydro and geothermal make up a modest contribution to the national energy mix (12% combined), other technologies including wind and solar have not been implemented and the readiness of the technology is poor. Biomass represents just 0.1% of the electricity mix despite its large potential.
Biogas	high	
Landfill Gas	unknown	
Geothermal	medium	

Barriers and Policies: Scoring: 1 = low/insignificant barrier, 4 = severe barrier

Barrier Category	Score	Summary
Institutional/political	3.2	The institutional environment is fragmented and lacking coordination, making it difficult to pass or implement meaningful public policy, and creating procedural complications for the private sector. Although the decision making is decentralised, local authorities often lack clear understanding of national policies and also the capacities to implement them locally.
Financial/economic	3.2	Upfront costs remain high due to the limited level of existing projects and RE infrastructure,

		although feed in tariffs do exist to mitigate this somewhat. Subsidies weaken the economic feasibility of RE. The state electricity company PLN cannot afford its own investment needs of approximately $10bn per year; private investment is required but is difficult due to the risky and complex business environment.
Technical	2.0	Many technology in the country are unproven and immature. Significant RE resources are located in remote areas that are far removed from existing grid facilities.
Informational/capa-cities	3.0	Lack of precise understanding of resource potential. Skills and awareness related to RE are insufficient across all stakeholder groups, including authorities, industry and the general public.
Social, cultural and behavioural	1.5	No significant barriers, except for a lack of experience with local community projects.
Policies summary: The government has set a target to generate 30% of energy from renewable sources by 2030. Feed in tariffs with fair rates exist for many technologies, however the procedures are too complex. Procurement processes are lengthy, expensive and risky, and not particularly attractive to private sector investors. However a range of tax exemptions on imported RE technology may go some way to mitigate the country's immature RE inventory.		

Matching barriers with financial instruments

Financial instrument	Institutional/ political	Financial/economic	Technical	Informational/ capacities	Social, cultural and behavioural
Equity		Public equity can provide needed infrastructure investment	Public equity can provide needed infrastructure investment		
Loans		Esp. low cost loan schemes will provide investment incentive; however access to market for IPPs needs to be improved			
Guarantees		Suitable to improve access to finance esp. for higher risk			

		projects/ technologies			
Policy incentives	Policy incentives can have indirect effects	Reform of feed in tariff to insure its effectiveness; scaling up of tax breaks for RE technology import		Policy incentives can have indirect effect to develop wider capacities	
Grants		Can provide additional incentive for less mature technologies; relevant for project development phase (feasibility studies)			
Non-finance interventions	Capacity building Regulatory change Awareness raising	Capacity building Regulatory change	R&D	Capacity building Awareness raising	Awareness raising

Summary:

The barriers to RE development and investment in Indonesia mainly relate to a complex institutional environment which is not conducive to (private sector) investment. There are also significant knowledge and capacity gaps across all levels and stakeholder groups which have left the large RE potential unexploited. Existing subsidies coupled with higher upfront costs of RE technologies weaken their economic feasibility. Financial instruments such as loans and guarantees may go some way to support RE investments, however, access to market for private players needs to be improved through regulatory change. In addition, fossil fuel subsidies should be removed to create a level playing field.

3.2.4 Samoa

Country: Samoa		Sector: RE in electricity
General indicators		
Credit rating	n.a.	**Country profile summary:** Samoa as one of the Pacific small island states is highly vulnerable to climate change hence adaptation concerns are much higher on the political agenda than mitigation. Given the small size of the country and remote location Samoa is not a target for international investment. The narrowly based economy, distance to major markets and limited natural resources present significant development challenges.
Competitive index	n.a	
Transparency index	n.a	
HDI 2012	0.7 (96/187)	
National mitigation potential and implementation to date		
Overall score	Medium	**Summary potential:** Although reasonable potential exists for renewable energy in Samoa, particularly solar and biogas, its implementation is hindered by a lack of precise research as well as concerns regarding the future suitability of several technologies. For example, irradiation levels might be limited by increased cloud cover through climatic changes, whilst the availability of water for hydro power is threatened by an increasing frequency of droughts and competition for scarce water with other uses. These issues are compounded by the construction of a new diesel generator in 2013. Diesel generation provides 55-70% of the current power mix and uptake of renewable will rely partly on the willingness to not use the new diesel generation capacity.
Wave	Low	
Solar	Med-High	
Wind	Low-Med	
Hydro	Low	**Summary implementation to date:** Hydro power is already widely implemented and contributes up to 33.7% of the energy mix, although it is unreliable in the face of increasing drought frequency and water competition. Very little solar capacity exists, although a series of new solar projects have been announced, which would account for up to 16% of national energy production. Small trails have been implemented for the use of coconut based oils as biodiesel in diesel generating facilities.
Biogas	Med-High	
Landfill Gas	Zero-Low	
Geothermal	Low	
Barriers and Policies: Scoring: 1 = low/insignificant barrier, 4 = severe barrier		
Barrier Category	**Score**	**Summary**
Institutional /political	2.5	The government bodies responsible for renewable energy are small and have capacity constraints. The power of the 'donor-push' in comparison to the country's limited capacities means there is limited opportunity for a more country-owned strategic approach.
Financial /economic	3.2	No mechanism exists to make the country's international finance available to project developers. Upfront costs for renewable technologies remain very high due to the lack of significant existing RE

		implementation and infrastructure.
Technical	2.0	Whilst the wind and solar technologies are well understood, biomass technologies in Samoa are immature and unproven, despite having perhaps the best potential.
Informational /capacities	3.5	Stakeholders and government departments lack experience, although this may be overcome through implementation.
Social, cultural and behavioural	1.5	No significant social or cultural barriers, other than a lack of experience working with local participation in power production.

Policies summary: Most projects are designed and implemented with extensive donor support, to the extent that the design and development of a country-owned long term RE plan is somewhat undermined. Policy does exist to allow small scale community IPPs to feed in to the grid, and some PPAs have been signed, but none of these projects have proceeded to construction and the policy is yet to be tested.

Matching barriers with financial instruments

Financial instrument	Institutional/ political	Financial/economic	Technical	Informational /capacities	Social, cultural and behavioural
Equity		Public equity can provide needed investment	Public equity can provide needed infrastructure investment		
Loans		Low cost loan scheme appropriate to reduce upfront cost barrier for developers			
Guarantees		Suitable to improve access to finance esp. for higher risk projects/ technologies			
Policy incentives		Stronger policy incentives to cover additional costs of RE		Policy incentives can have indirect effect to	

				develop wider capacities	
Grants		Can provide additional incentive for less mature and small scale technologies; relevant for project development phase (feasibility studies)	Scheme to focus on less well known but mature technologies	not appropriate	
Non-finance interventions	Capacity building	Capacity building	R&D Demonstration projects	Capacity building Awareness raising	Institutional change Awareness
Summary : Both financial and capacity constraints are considered the most important barriers to RE development in the country. Knowledge of RE technologies is limited and technologies are largely unproven. There are no policy incentives in place to stimulate uptake of RE technologies, and recently investments in additional diesel based generation capacity were made. Instruments such as low cost loans, guarantees and grants are likely to encourage (private) investment in RE projects, however, finance schemes would need to be supported by capacity development to be effective. A more comprehensive strategic approach at the national level would also be important to provide policy certainty for potential investors.					

3.2.5 South Africa

Country: South Africa		Sector: RE in electricity
General indicators		
Crediting rating	BBB (S&P)	**Country profile summary:** South Africa is an emerging economy which has undergone fundamental political change in the recent past. Despite significant economic growth, many development challenges remain as the country has one of the highest inequality rates in the world. The energy system is dominated by significant domestic coal resources. At the same time the country is a highly active player in the climate change negotiations and has put forward ambitious national low carbon development plans.
Competitive index	4.37 (57/152)	
Transparency index	42 (72/175)	
HDI 2012	0.63 (121/187)	
National mitigation potential and implementation to date		
Overall score	**Medium to high**	**Summary potential:** The potential for RE energy is relatively high**.** Especially wind and solar energy represent promising sources of energy with relatively low costs and a high national prioritizations.
Wave	Medium	
Solar	High	
Wind	High	
Hydro	Medium	**Summary implementation to date:** The experience with RE technology in South Africa is very low as the energy mix has been dominated by locally sourced coal generation. None of the RE technologies reached a share in 2012 above 0.1% of electricity generation capacity. However patent data suggests that there are some activities ongoing in the industry.
Biogas	Low / medium	
Landfill Gas	Medium	
Geothermal	Low	

Barriers and Policies: Scoring: 1 = low/insignificant barrier, 4 = severe barrier **(Score 1 low - 4 high)**

Barrier Category	Score	Summary
Institutional/political	3.2	Very unconducive environment to change due to coal domination, often unclear and lengthy procedures, very weak network between public and private sector outside of ESKOM and Sasul; targets in white paper too weak to stimulate investment
Financial/economic	3.6	Old grid structures require large investments to accommodate RE in the future; coal as a substitute technology is very cheap which increases relative costs of RE, however strong financial market exist that should be able to provide finance. The South African market is not open; ESKOM as semi monopolized energy supplier lacks resources to invest in capacity expansions
Technical	3.0	While most technologies have been tested in the country, there is limited experience in the country with RE at larger scale; existing grid structure is not sufficient to accommodate large

		amounts of intermittent RE energy sources
Informational/capa-cities	3.0	Human capacity is very limited due to the limited experience with RE technologies
Social, cultural and behavioural		No barriers identified

Policies summary: There have been repeated efforts in SA to set up supportive policies for RE. In 2009 a RE FIT scheme was introduced which was cancelled in 2010, partially following a strong lobby against it. Currently a tender process is in place that has allocated 1451 MW to successful bidders. However due to its structure, it will only support large scale projects and it remains unclear if all the projects that were allocated finance will actually be built. (In the past tender processes have shown to not deliver). Only a limited list of technologies were tendered out, some, including geothermal, were not included.

Matching barriers with financial instruments

Financial instrument	Institutional/ political	Financial/economic	Technical	Informational/ capacities
Equity		Public equity can provide needed infrastructure investment	Public equity can provide needed infrastructure investment	
Loans		Esp. low cost loan schemes will provide investment incentive; however access to market for IPPs needs to be improved		
Guarantees		Suitable to improve access to finance esp. for higher risk projects/ technologies		
Policy incentives	Policy incentives can have indirect effects	Need stronger policy incentives to cover additional costs of RE (current incentives not sufficient) and market not open to IPPs (grid access)		Policy incentives can have indirect effect to develop wider capacities
Grants		Can provide additional incentive for less mature technologies;		

		relevant for project development phase (feasibility studies)		
Non-finance interventions	Capacity building Regulatory change Awareness raising	Capacity building (finance sector) Regulatory change	Regulatory change R&D	Capacity building Awareness raising

Summary:
South Africa faces several barriers to RE development across all barrier categories, with financial and institutional barriers showing the highest scores. A key problem is the lack of access to market for independent power producers due to the domination of the national energy company. Therefore finance instruments which stimulate investment, such as low cost loans, guarantees or grants, are likely to be of limited effect without an opening of the energy market. The potential for renewables is generally high, but it would have to compete with relatively low cost coal in the grid. Schemes to encourage RE systems for self-supply could also be interesting in particular in the face of rising electricity prices.

3.3 Country factsheets energy efficiency in the building sector

3.3.1 Bangladesh

Country: Bangladesh		Sector: Building energy efficiency
General indicators		
Crediting rating	BB – (S&P)	**Country profile summary:** Bangladesh is a least developed country with a significant proportion of the population (31%, ADB) living below the poverty line. The country is highly vulnerable to climate change therefore adaptation is the key focus. Given the number of severe development challenges, including lack of access to basic services for large parts of the population, mitigation to climate change, i.e. also energy efficiency, has a very low priority.
Competitive index	3.71 (110/152)	
Transparency index	27 (136/175)	
HDI 2012	0.52 (146/187)	
National mitigation potential and implementation to date		
Overall score	**medium**	**Summary potential:** Buildings make up the largest share (45%) of the national mitigation potential, and the mitigation potential for energy efficiency in buildings is moderate to high. In particular, modern lighting technologies have a high potential, using available technology at an affordable cost. Air conditioning and white appliances do not have very widespread use at present in Bangladesh, but the significance of these technologies will increase in the future as the country develops, and energy-efficient technologies are largely cost-effective.
Appliances	medium	
Lighting	high	
Air conditioning	medium	
White appliances	medium	**Summary implementation to date:** Whilst building codes are in place, they are focused on Bangladesh's more immediate problems such as safety and protection from frequent natural disasters, and energy efficiency does not take high priority. In any case, the building code is rarely enforced, in part due to the high prevalence of informal housing. For formal buildings the codes are commonly followed in the design phase and violated during construction. There are no mandatory standards for appliances, although voluntary performance standards are under development. 11 LEED certificates have been issued in Bangladesh, mostly in the textile manufacturing industry according to the requirements of multinational companies.
Integrated building measures	medium	
Solar water heating	medium	
Cooking	medium	
Barriers and Policies: Scoring: 1 = low/insignificant barrier, 4 = severe barrier		
Barrier Category	**Score**	**Summary**

Institutional/political	3.4	Although the potential is understood and there are plans to update the building code and develop labels, the process is complicated by interactions amongst many authorities and progress is not visible. Modern technologies, such as LED lighting, are missing from relevant codes, plans and strategies.
Financial/economic	3.3	Energy costs do not take very high priority and end users are not well informed about market conditions and the costs of their own consumption. Upfront costs for EE may be high, whilst the building owner is often not paying the costs for energy use.
Informational/capacities	3.5	There is a lack of information, as well as human capacity in terms of both quantity and quality of skills related to energy efficiency.
Social, cultural and behavioural	4.0	Significance of energy savings is low compared to disaster protection, due to the very high vulnerability of the country to natural disasters, and their increasing frequency.

Policies summary: The latest version of the National Building Codes (2013) include sections for sustainability and green design, but the extent to which these codes will be enforced is uncertain, especially considering the widespread violation of previous building codes. Loose regulation exists for efficient appliances, although lack of financial support hinders stringency. Product performance standards are only voluntary. Other incentives are basically non- existent .

Matching barriers with financial instruments

Financial instrument	**Institutional/political**	**Financial/economic**	**Informational/capacities**	**Social, cultural and behavioural**
Equity		Only suitable for larger scale investments; unlikely to be relevant here		
Loans		Low cost loans useful to improve access to finance/ reduce investment costs especially relevant for cost effective EE options with high up-front costs		
Guarantees		Improve access to finance where projects perceived as high risk		

Policy incentives	Bonus or penalty schemes to incentivise compliance with building code	Tax breaks or subsidy scheme useful to incentivise owners/ investors; scheme to improve attractiveness of EE for commercial banks		
Grants		Useful to incentivise investment esp. for small projects		
non-finance interventions	Capacity building Regulatory change Policy change	Capacity building (finance sector) Policy change	Information and awareness campaigns Capacity building	Capacity building Awareness raising Policy change

Summary:
The country faces significant barriers to building energy efficiency across all categories. There is little awareness and professional capacity and the topic is not a priority as climate resilience priorities ranks much higher. Access to finance and higher upfront costs of energy efficient equipment and technologies is a problem, however, uptake of cost efficient technologies is very low, pointing to the relevance of other, non-financial barriers. Finance mechanisms may support uptake, e.g. through grants or low cost loans, however more importantly regulatory change (e.g. building code) and change in political priority of energy efficiency is needed.

3.3.2 China

Country: China		Sector: Building energy efficiency
General indicators		
Crediting rating	AA- (S&P)	**Country profile summary:** China has moved from a centrally planned to a market based economy in recent times and is experiencing rapid economic and social development. GDP growth has averaged 10% per annum and the country is on track to achieve all its Millennium Development goals. As the second largest economy in the world China is a key player in the international climate negotiations and central for achieving global mitigation objectives.
Competitive index	4.84 (29/148)	
Transparency index	40 (80/175)	
HDI 2012	0.70 (109/187)	
National mitigation potential and implementation to date		
Overall score	high	**Summary potential:** Mitigation potential through EE in China's building sector is very high. Buildings represent a fifth of China's GHG emissions and over half of the world's new buildings each year are built in China. There is therefore significant potential for standards for new construction, as well as retrofitting the existing inefficient building stock, both of which may be achieved cost effectively.
Appliances	high	
Lighting	high	
Air conditioning	high	
White appliances	high	**Summary Implementation to date:** A building code is in place however, compliance is not always enforced. Standards for appliances exist and numerous buildings have been labelled with green building certificates (albeit the impact on GHG emissions is questionable).
Integrated building measures	high	
Solar water heating	high	
Cooking	medium	
Barriers and Policies: Scoring: 1 = low/insignificant barrier, 4 = severe barrier		
Barrier Category	**Score**	**Summary**
Institutional/political	2.2	Strong commitment to enhance EE is demonstrated at national level, but hindered by weak networks between parties and by the lack of monitoring and enforcement of existing codes and policies due to a weak legal framework. At the local level, this often creates a culture of non-compliance and an environmental "race to the bottom" for the sake of competition.
Financial/economic	2.9	Higher cost of initial investment is a barrier as well as the lack of financial incentives to support investments in energy efficiency. Split incentives are also a problem.
Informational/capa-	3.5	Technical capacity is limited and the distribution of information is also weak. Knowledge of EE

cities		options is not widespread and there are large discrepancies between regions in the country.
Social, cultural and behavioural	3.0	Awareness of the requirements and opportunities for EE is improving, although progress in implementation is slow. Most Chinese people believe government should play a key role in energy saving, instead of linking enhancement of efficiency and savings to their own behaviour.

Policies summary: There have been efforts in China to set up supportive policies for energy efficient buildings and appliances. The government realizes the importance of such measures to cope with the booming construction sector and the increase in the Chinese standard of living which leads to more consumption. But financial and human means are largely insufficient to change behaviours, and efforts are still needed to improve enforcement and monitoring of existing EE policies and measures.

Matching barriers with financial instruments

Financial instrument	**Institutional/political**	**Financial/economic**	**Informational/capacities**	**Social, cultural and behavioural**
Equity		Suitable for large scale investments/ building projects		
Loans		Low cost loans useful to improve access to finance/ reduce investment costs		
Guarantees		Improve access to finance where projects perceived as high risk;		
Policy incentives	Bonus or penalty schemes to incentivise compliance with building code	Tax breaks or subsidy scheme useful to incentivise owners/ investors		
Grants		Useful to incentivise investment esp. for small projects		
Non-finance interventions	Capacity building Regulatory change Policy change	Capacity building Policy change	Information and awareness campaigns Capacity building/ training	Capacity building Awareness raising

				Policy change

Summary :
The main barriers to building energy efficiency in China are related to cultural, institutional and information barriers. The lack of individual ownership and responsibility for energy efficiency in society is a problem, so is the lack of knowledge and awareness of its benefits. Institutional and capacity barriers lead to low enforcement of existing policies and codes. Financial mechanisms may go some way in supporting energy efficiency by improving access to finance, however, these will not lead to the necessary shift of the sector. There are large amounts of financing available in China that may best be mobilized through risk reducing instruments such as guarantees or low cost policy incentive schemes. Regionally specific interventions may also need to be considered given the diversity of the country.

3.3.3 Mexico

Country: Mexico		Sector: Building energy efficiency
General indicators		
Credit rating	BBB+ (S&P)	**Country profile summary:** Mexico has undergone a deep economic transformation in the past decades as one of the leading emerging economies and OECD member. The country has significant energy resources and is a major oil producer and exporter. In climate change terms Mexico has been a proactive leadership and has put forward ambitious climate change plans and programmes including a quite unique climate change law.
Competitive index	4.34 (55/152)	
Transparency index	34 (106/175)	
HDI 2012	0.78 (61/178)	
National mitigation potential and implementation to date		
Overall score	**high**	**Summary potential:** Mexico has a high potential for energy efficiency mitigation in the building sector due to the relatively aged technologies used in the existing building stock and the relative cost effectiveness of energy efficiency measures. Increased uptake of energy efficient appliances, as well as the use of solar water heating and cook stove technologies, represent the best mitigation options, together with buildings integrated measures focusing especially on cooling.
Appliances		
Lighting	medium	
Air conditioning	high	
White appliances	high	**Summary Implementation to date:** A building code is in place which is effectively administered at the state and municipality level, however, enforcement is weak. Labelling and Minimum Energy Performance Standards (MEPS) have increased availability of energy efficient appliances.
Integrated building measures	high	
Solar water heating	high	
Cooking	high	
Barriers and Policies: Scoring: 1 = low/insignificant barrier, 4 = severe barrier		
Barrier Category	**Score**	**Summary**
Institutional/political	2.3	Weak enforcement and monitoring of building codes and energy efficiency standards. Standardized schemes for material and construction techniques are lacking, although technology standards for appliances are better than in other countries.
Financial/economic	3.2	Fossil-fuel subsidies are a disincentive to invest into EE. Higher upfront investment costs are perceived as prohibitive and access to finance for energy efficiency measures can be difficult due to perceived risk and size of projects.

Informational/capacities	4.0	There is a lack of qualified staff for energy efficiency issues, among building professionals as well as end users. Lack of knowledge of banking professionals on structuring finance and their ability to assess EE projects is also a major barrier.
Social, cultural and behavioural	2.5	Lack of environmental awareness in society in general and in particular in rural communities (e.g. resistance to improved cook stoves).

Policy summary: There are several relatively successful initiatives to encourage energy efficiency in new buildings in Mexico, e.g. the Esta es tu casa programme and the Green Mortgage Initiative. However they only cover a limited portion of the overall new building stock. There are building standards but they are often not enforced at the state level. A number of efficiency norms for appliances exist, however, import of old equipment from the US is counteracting this. In the area of retrofitting where hardly any policy measure can be found, a NAMA is currently being implemented.

Matching barriers with financial instruments

Financial instrument	**Institutional/political**	**Financial/economic**	**Informational/ capacities**	**Social, cultural and behavioural**
Equity		Only suitable for larger scale investments; unlikely to be relevant here		
Loans		Up-scaling of existing low cost loans useful to improve access to finance/ reduce investment costs		
Guarantees		Improve access to finance where projects perceived as high risk;		
Policy incentives	Bonus or penalty schemes to incentivise compliance with building code and standards	Tax breaks or subsidy scheme useful to incentivise owners/ investors; Removal of subsidies		
Grants		Additional investment incentive esp. for smaller projects		
non-finance interventions	Capacity building Regulatory change	Capacity building (finance sector) Policy change	Information and awareness	Capacity building

	Policy change		Capacity building/ training Demonstration projects	Awareness raising

Summary :

Capacity gaps and knowledge barriers are significant to move building energy efficiency in Mexico although financial barriers are also high. Finance barriers relate mainly to prohibitive electricity subsidies, higher upfront costs and difficult access to finance due to a lack of awareness and perception of high risk of EE projects amongst finance professionals. An up-scaling of existing support schemes, preferential loans or grants, will provide investment incentives, however, structural problems, including fossil fuel subsidies, low enforcement of existing policies and a lack of capacity to implement EE measures need to be addressed.

3.3.4 Philippines

Country: Philippines		Sector: Building energy efficiency
General indicators		
Credit rating	BBB-(S&P)	**Country profile summary:** The Philippines is one of the rapidly industrialising countries in the region with strong growth prospects, although many development challenges remain. The country is a net energy importer. Renewable energy, esp. geothermal and hydro, represent over 30% of the electricity mix. As the country is highly vulnerable to climate change, esp. storms and floods, adaptation has a strong focus. However, the Philippines are also putting in place ambitious low carbon development plans and targets.
Competitive index	4.29 (63/152)	
Transparency index	36 (94/175)	
HDI 2012	0.65 (114/197)	
National mitigation potential and implementation to date		
Overall score	**high**	**Summary potential:** The potential for mitigation through energy efficiency in the Philippines is high especially for the commercial and high end residential building sector. The use of inefficient air conditioning units as well as inefficient lighting in commercial buildings represents the majority of the growing electricity demand in the sector, and this can be cost effectively mitigated through the installation of modern appliances as well as insulation and building integrated measures. Significant potential remains for solar water heating in commercial and residential buildings, with use of the technology becoming more widespread and therefore more cost-effective. Cooking appliances play
Appliances	high	
Lighting	high	
Air conditioning	high	
White appliances	unspecified	**Summary implementation to date:** Whilst a package of building codes and standards is in place, it is not certain that the codes are adequately enforced. An existing green building rating system is experiencing growing uptake leading to voluntary energy efficiency upgrades. There is also increasing demand for environmentally friendly commercial buildings from multinational companies with operations in the country.
Integrated building measures	high	
Solar water heating	high	
Cooking	high	
Barriers and Policies: Scoring: 1 = low/insignificant barrier, 4 = severe barrier		
Barrier Category	**Score**	**Summary**
Institutional/political	2.4	The government is committed to pushing energy efficiency but it is not the highest priority. Lack of coordination between central and local government and overly complex procedures hinder investment and access to finance. Current building codes do not

		focus on energy efficiency and are often times not fully enforced.
Financial/economic	2.4	Higher upfront costs are a barrier. However, several affordable loan cost options are available. Coupled with relatively high consumer electricity prices in the country, financial viability of energy efficiency is generally good. Split incentives may be a problem but have not been identified specifically in the research. Reluctance of commercial banks to provide finance for EE due to perceived risk and small investment size is also a problem.
Informational/capa-cities	3.5	There is a significant lack of awareness regarding the potential for EE in the Philippines and technical options as well as financial facilities available to exploit it. Technical skills and capacities are also lacking.
Social, cultural and behavioural	1.8	There are no significant cultural or social barriers. EE is not a priority for consumers.
Policies summary: The standard package of codes and regulations is somewhat outdated, and a 2010 Act to commission a new Green Building Code has not yet produced an output. Several labelling programmes are in place, and energy labelling is mandatory for all appliances. A Guideline for Energy Efficient Design for Buildings has also been released, for voluntary participation. There are several affordable loan programmes available for energy efficiency investment, however, uptake has been slow.		

Matching barriers with financial instruments

Financial instrument	**Institutional/ political**	**Financial/economic**	**Informational/capacities**	**Social, cultural and behavioural**
Equity		Only suitable for larger scale investments; unlikely to be relevant here		
Loans		Up-scaling of available low cost loan schemes		
Guarantees		Improve access to finance where projects perceived as high risk		
Policy incentives		Tax breaks or subsidy scheme useful to incentivise owners/ investors; scheme to improve attractiveness of EE for commercial banks		

Grants		Useful to complement loan schemes to further incentivise investment esp. for smaller projects		
non-finance interventions	Capacity building Institutional change Policy change	Capacity building (finance sector)	Information and awareness campaigns Capacity building	Capacity building Awareness raising Policy change
Summary : Barriers to building energy efficiency mainly relate to a lack of information and capacities in the sector. This is coupled with structural problems of split incentives as is common in most countries. Financial barriers are relatively low as investments in energy efficiency are not cost prohibitive. In addition various loan schemes exist, however, their uptake has been slow. Up-scaling of existing loan schemes as well as other financial incentives (e.g. grants) may be useful to support energy efficiency, however, these need to be accompanied by a wider set of interventions to be effective.				

3.4 Findings from the case studies

This section draws conclusions and learnings from the nine case studies as well as the literature review. We identify commonalities across country groupings and sectors with regards to barriers and the roles of financial instruments to overcome these. The section discusses a number of aspects that need to be considered in the context of international climate finance and in particular with regards to the role that public climate finance can play to shift investment towards low carbon choices.

3.4.1 Renewable Energy (RE)

We looked at renewable energy technologies in five countries, namely Chile, South Africa, Indonesia, Ethiopia and Samoa. The following observations can be made with regards to the different aspects considered.

Technology potential, market maturity and policies:

- The potential of different renewable energy technologies is generally high in all countries including for proven, market ready technologies, such as e.g. wind, solar, biomass, small hydro.
- In all countries the existing, generally significant potential is not exploited. Some countries have large hydro capacity (e.g. Ethiopia, Chile, Samoa) however, opportunity for additional large scale hydro to meet growing energy demand is limited due to environmental concerns.
- In all countries significant investment will be needed to modernise, expand and adapt grid infrastructure for large scale incorporation of renewable energy sources and connecting resources with centres of demand.
- Larger developing countries and emerging economies have nascent technology and service markets (South Africa, Chile, Indonesia), however in the LDC and SIDS (Ethiopia and Samoa) there is little to no local industry that could service the market.
- In all countries some policy interventions have been made to boost renewable energy technologies. The spectrum is large, ranging from small donor financed technology initiatives, to tax incentives, public tender schemes and feed in tariffs.
- In none of the countries has the policy been adequate so far. In most cases effectiveness of the policy is unclear or, as is the case for Chile, the policy is proven but not stringent enough.

Barriers:

- Barriers to renewable energy are diverse, including institutional, financial, capacity and information barriers.
- All barriers need to be addressed systemically, meaning that they need to be addressed comprehensively and simultaneously. One single barrier can hamper the functioning of the whole system and therefore stop renewable energy from being implemented.

- Capacity and knowledge barriers are significant in all countries, ranging from a general lack of awareness to a lack of technical skills and capacity in the market.
- Financial and economic barriers are also significant, however, interestingly not always the dominant barrier (e.g. Chile).
- The importance of individual barriers and the barrier mix is different for each country, suggesting that country specific approaches are necessary to overcome them.
- In larger developing countries and emerging economies availability of capital is generally less of a problem. Here access to finance is a common barrier due to the (perceived) risk profile of RE technologies and a generally inexperienced banking sector.
- For LDC and SIDS high upfront costs and availability of (as well as access to) finance are key barriers.
- Financial attractiveness of RE technologies differs significantly and is not necessarily related to the economic maturity of the country but to the cost of alternative technologies. Where (cheap) domestic resources are available (e.g. South Africa) significant effort will be required to improve competitiveness of renewables.
- In many countries there are barriers to market for individual investors, either regulatory or institutional or because of vertically integrated, monopolistic market structures (e.g. South Africa). In addition, potential investors often face pre-investment barriers, i.e. lack of capital to finance project preparation.

Financial instruments:

- Financial instruments are appropriate to remove certain barriers – mainly financial ones – but need to be complemented by a suite of instruments and measures to address all identified barriers holistically. Especially the enabling environment needs to be further supported through capacity building and institution building initiatives.
- Especially where economic conditions are not favourable (e.g. fossil fuel subsidies, abundant domestic fossil resources), financial instruments are unlikely to be effective. Particularly here, deeper structural changes will be needed, including non-financial measures and longer term engagement strategies at the political level to improve underlying market conditions.
- In relatively developed markets (e.g. emerging economies) guarantee schemes are likely to be effective instruments to improve access to finance and stimulate investment (provided that the technology is cost effective from a societal perspective). However guarantee and loan schemes are only really effective in a deregulated, open market environment which provides access to new players. In state controlled markets (e.g. South Africa) the ability for public sector investment would need to be strengthened or the market would need to be reformed before considering such instruments.
- Grant schemes are mostly suitable in less developed markets (e.g. LDCs, SIDS) where availability of capital and high upfront costs are a key problem.
- Grants may also be provided in the pre-investment phase (e.g. to prepare feasibility studies, carry out due diligence).

3.4.2 Building Energy Efficiency

Building energy efficiency was considered in four countries, including China, Mexico, Philippines and Bangladesh. Observations on the key aspects considered follow below.

Technology potential, market maturity and policies:

- There is potential for building energy efficiency in all countries, however, the potential is significantly higher in the large emerging economies where building activity is booming and where there is a large existing (and mostly inefficient) building stock.
- Key technologies and measures include efficient cooling/ heating, insulation and lighting technologies for new buildings or retrofit. Efficient appliances also present important mitigation potential.
- Some experience with efficient appliances and solar water heating exists in most countries, however, there is little evidence of the application of more holistic, integrated building design measures and approaches.
- For LDCs building energy efficiency has very low priority as they face many development challenges, including access to basic services and housing.
- All countries have some form of building code in place however, implementation and policing of the code is generally not followed through. Furthermore these building codes rarely include stringent if any energy efficiency considerations.
- Regulation and policy for building energy efficiency are generally inadequate with the exception of Mexico and China, where more comprehensive policies and initiatives are in place, albeit also not stringent enough to drive transformation.

Barriers:

- Across all countries information and capacity barriers ranked highest, i.e. before financial barriers. These mainly relate to the lack of knowledge of energy efficiency and associated benefits as well as a lack of capacity of technical skills in the market.
- In many countries cultural and behavioural barriers are also important as generally there is little to no awareness of energy efficiency or recognition of individual responsibilities.
- High upfront investment needs of energy efficient technologies and design options are a barrier in all countries. Although over their lifetime most technology options are generally cost effective.
- Split incentives are another key issue preventing investment into energy efficiency measures by building owners where benefits are accrued by another party (e.g. tenants/ occupants).
- Generally the spectrum of barriers to building energy efficiency is quite uniform across different country types. Differences in barriers result from individual country characteristics rather than the development level or the size of the country.

Financial instruments:

- Financial instruments are effective to remove certain, mainly financial barriers. However to be effective they need to be accompanied by other measures (e.g. strong regulatory framework, capacity building) as financial barriers are typically not the most significant ones.
- Low cost loan schemes are useful to improve access to finance and reduce investment costs, especially for cost effective technology options with high upfront investments.
- Grant schemes are also suitable to address the high upfront cost barriers, especially for smaller sizes projects (e.g. individual household level).
- Guarantee schemes may also go some way in improving risk return ratios for investors and improve access to finance where projects may be perceived as high risk.

3.4.3 Summary – Financial instruments

Table 15 below provides a summary of the characteristics of different financial instruments based on the RE and building energy efficiency case studies.

Table 15: Summary – Applicability of financial instruments

Instrument	Where is the instrument most effective?
Grants	- Preparation of pre-feasibility studies/ pre investment phase - Smaller scale projects/ technologies (off grid, self-supply, household level) to address high upfront cost barrier - Mostly in less developed, less mature markets where availability of capital can be a problem - Complementary to other instruments to provide additional boost
Concessional loans	- In markets with open access for investors to improve access to finance and reduce investment costs - More suitable in countries with relatively developed commercial sectors
Guarantees	- In markets with relatively mature commercial banking sector and open access for investors - Where the mitigation option is cost effective in the long term, but where high upfront investments pose a significant risk. - In combination with concessional loan schemes to improve access to finance/ enable operation of loan schemes
Public equity	- Suitable for large scale investments with low rates of return (infrastructure) or where market entry for investors is limited
Private equity/ market rate loans	- Where technologies are cost competitive and present attractive risk return ratios

4 General conclusions

In the following we draw out four key conclusions from the case study exercise and research we have undertaken here. The aspects discussed are important to understand the role that financial instruments can play as well as the respective roles of public and private financial support and investment.

1. **The overall market conditions for RE and EE investment are an overriding factor to determine the role public finance can have and the choice of instrument.**

At the highest level two cases can be distinguished.

A) ***The technology is cost effective from a societal perspective but may not be attractive from a developer's perspective***. In cases where the technologies are cost effective - for example many building energy efficiency technologies as well as certain RE technologies, e.g. in Chile – financial instruments such as guarantee schemes and low interest loans can be effective. Here only relatively small injections of public finance would be required to push (private sector) investment in low carbon technologies.

B) ***The technology is neither attractive from a societal perspective nor from an investor's perspective.*** In the case of RE this may be caused by availability of (cheap) domestic fossil resources (e.g. as is the case in South Africa) or the existence of fossil fuel subsidies. Without removing these underlying factors, financial support to RE technologies would need to be significant, i.e. large sums of (public) finance would be required to level the financial attractiveness of RE technologies. Other policy and regulatory instruments could be more appropriate (e.g. removal of fossil fuel subsidies or a carbon tax).

Another underlying factor which is important to consider, especially in the context of grid connected renewable energy technologies, is the structure of the sector. This includes the ***level of deregulation and privatisation and the diversity of the sector***. Where the sector is dominated by one or a few publicly owned companies, instruments which target stimulation of private investment (e.g. guarantees, concessional loan schemes) are not effective, or only suitable for off grid solutions. Here instruments that strengthen the financial capacity of the public company need to be considered.

There are factors which influence the viability of technologies over time and may result in a technology moving from one case to another. For example this could include technological learning or rising or falling fuel prices.

2. Financial instruments are suitable to remove certain barriers but cannot operate effectively on their own.

Financial instruments are effective to remove certain mainly financial barriers. However, in most cases barriers to RE and energy efficiency technologies are manifold. It is important to understand the specific barrier mix in each country and to design interventions accordingly. In order to be effective financial instruments need to be accompanied by other, non-financial measures.

Figure 5 provides an overview of different barriers and where different financial instruments and non-financial interventions are appropriate. The Figure also shows barriers according to different phases of the project or investment cycle as well as the enabling framework. This is an important additional dimension to determine the most effective financial instrument.

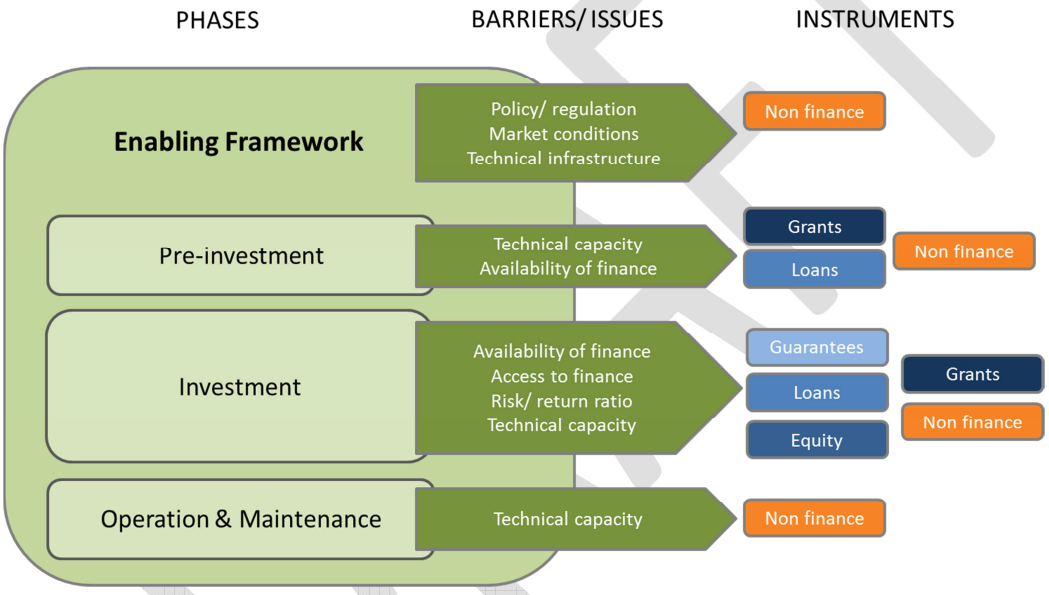


Figure 5: Financial instruments in relation to barriers and project cycle

3. Different financial instruments are more or less suitable at different stages of the technology cycle.

When selecting the right financial instruments it is important to consider at which stage of the cycle the technology needs to be supported (see Figure 6). Grant schemes are most appropriate at the early R&D and demonstration stage. Publicly supported guarantee and concessional loan schemes can support the scaling up of the technology until it has reached commercial maturity, at which stage commercial loans and private equity are suitable. Public equity may be appropriate at both the very

early as well as the scaling up stage, whereas policy instruments should be considered throughout all stages of the cycle.

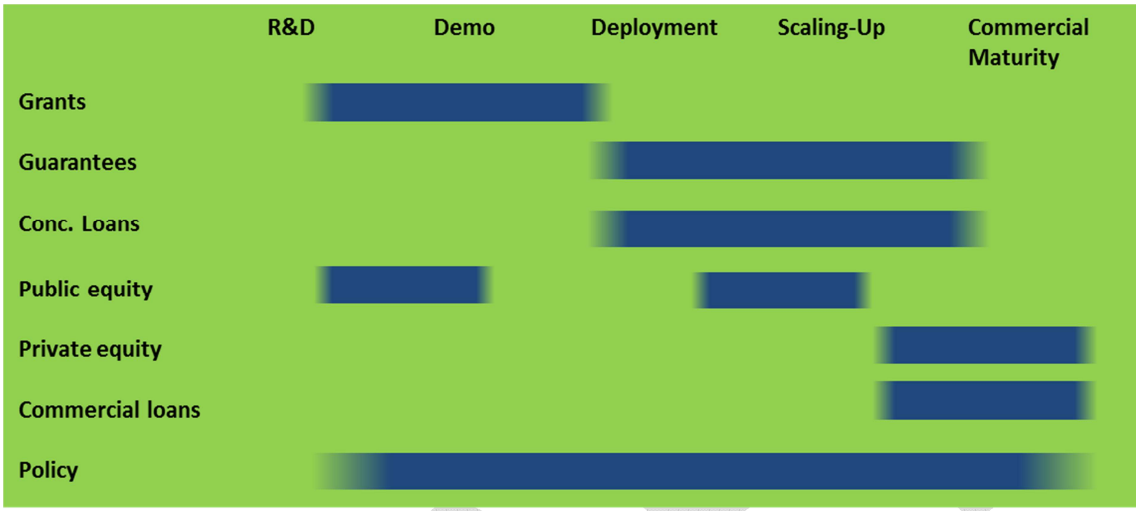


Figure 6: Financial instruments in relation to technology cycle

4. Solutions need to be country specific

The analysis showed certain commonalities within country groups and within sectors. For example, in emerging economies the availability of capital is likely to be less of a problem, meaning that financial instruments which address investment risks (e.g. guarantees) are likely to be more appropriate than in less developed economies where the availability of capital is a problem per se. In the building sector, capacity and knowledge barriers are significant across all country groupings, also institutional issues such as the lack of enforcement of building codes and the structural problem of split incentives are ubiquitous.

Despite these commonalities we can conclude that barriers to low carbon technology, or better, that the relevance and mix of specific barriers is country specific and not only related to the sector or the development status of the country but to individual circumstances. Solutions therefore also need to be country specific preceded by a detailed analysis and understanding of the national context and market conditions.

5 Outlook

Below we discuss additional research that could be undertaken to advance on the two research questions addressed in this paper: How much (public) financing is needed and how can this be best utilized in country specific contexts to achieve mitigation objectives. Drawing on our case study analysis, we first discuss how these can be extended to get an even better understand how financing can best be utilized in specific country contexts. We then move on to new way to analyse climate finance needs from a climate finance provider's perspective.

5.1 Extension of case study analysis

The study has shown that the need for finance instruments is very different from country to country. While our analysis was comprehensive and transparent in that it applied a methodology across all sectors, the scope of this project could only scratch the surface. In order to improve the insights more detail could be added to the case study analysis in the following ways:

- ***A better understanding of the potential and especially costs of technological options***: Our analysis reviewed existing studies on potential and cost estimates and in cases these were not available, made qualitative judgements. While we found that sufficient potential exists in all countries, it remains unclear how much this will costs. Especially an understanding of the cost situation of technologies could help improve the analysis. For instance in some countries technologies are already cost effective today (see for instance (Schmidt et al. 2012)). Here it would be important to consider both the costs from a societal perspective as well as from an investor's perspective.
- ***A better understanding of underlying barriers***: We based our analysis on existing barrier studies as a main source. However in many countries such analyses do not exist or are of limited quality. Additional in-depth analysis could be undertaken to further understand the relative importance of individual barriers and to identify ways of how non-financial barriers could be overcome. For instance a set of expert interviews could be conducted to understand the situation in the country better.
- ***A better understanding of existing policies***: We reviewed existing policies based on a literature review. This allowed us to get a view of where policies exist, however it only allowed us to understand their effectiveness to a limited extend. Further in-depth policy analysis could include an assessment of how existing policies could be strengthened or new policies could be added to help address the barriers in the country as well as their interplay with financial instruments.
- ***A better understanding of appropriate financial instruments***: We matched the barriers with appropriate finance instruments from a high level and potentially limited perspective. The use of financial instruments often depends on a lot more factors than those that could be taken account of in our analysis. For instance countries might have a cultural preference for

certain instruments or the risk profile of a country might favour one instrument over another (Schmidt et al. 2012)

- ***Update of existing analysis***: A regular update of the analysis to monitor progress and understand how the system advances could be made to determine choice of interventions.

Furthermore the analysis could be extended in its coverage in the following ways

- ***Cover additional sectors***: Additional sectors that could be covered include the transport, industry and agricultural sector. Studies have shown that large potential for mitigation options that are attractive from a societal perspective but currently not for private investors exist (especially in the industry energy efficiency). Here climate finance interventions can be very effective (see Case A above).
- ***Cover additional countries***: Our current selection was very much based on the availability of data. The analysis could be extended to other countries that might be equally or more important in the international context but that were not considered here. A broader country coverage would allow for sounder cross-country generalizations.

5.2 Analysis from the climate finance provider's perspective

As shown in Section 2 of this report estimates on financial needs from a climate finance provider's perspective do not exist. We suggest to develop a novel approach to address this gap. To fully understand the finance needs from a climate finance provider's perspective information on finance needs in three categories needs to be understood:

- How much finance is necessary to move private sector to accept higher risks and longer payback periods?
- How much finance is necessary to remove institutional and regulatory barriers?
- How much finance is necessary to support high costs options?

For this we suggest to build on the case study analysis to identify country by country how much finance is needed in each of the categories. The current study describes the necessary financial instruments in a qualitative manner. Based on this analysis, in combination with an enhanced cost analysis, one would analyse how much funding is needed for each of the three categories. From this information a priority list could be developed on how to spend the limited public funds most effectively. In essence this could lead to an approach to the question of how to spend the pledged US$100 bn as well as who is most suitable to mobilize finance for this.

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Annex I – Simplified overview of country specific investment information

The complete simplified version of the overview table (extracted from Excel file "Climate Finance Overview_v1_0") is provided below.

Table 16 Full simplified overview table of country specific investment information

Country	Pledge	National climate law	National climate strategy	LEDS	NAMA	TNA/ TAP	Investment Plans -CTF	Summary Cost Availability
Afghanistan	No	No	No	No	No	No	No	
Albania	No	No	No	No	No	No	No	
Algeria	No	No	No	No	Yes (2)	No	No	
Andorra	No	No	No	No	No	No	No	
Angola	No	No	No	No	No	No	No	
Antigua and Barbuda	No	No	No	No	No	Yes	No	
Argentina	No	No	Yes	No	Yes (2)	Yes	No	2
Armenia	No	No	No	No	No	Yes	No	2
Azerbaijan	No	No	No	No	No	Yes	No	2
Bahamas	No	No	No	No	No	No	No	
Bahrain	No	No	No	No	No	No	No	
Bangladesh	No	No	Yes	Yes	No	No	No	
Barbados	No	No	No	No	Yes (1)	No	No	
Belize	No	No	No	No	No	No	No	
Benin	No	No	No	No	No	Yes	No	
Bhutan	Yes	No	No	Yes	No	Yes	No	2
Bolivia	No	No	No	No	No	Yes	No	
Bosnia and Herzegovina	No	No	No	No	No	No	No	
Botswana	No	No	No	No	No	Yes	No	

Brazil	Yes	Yes	Yes	Yes	Yes (1)	No	No	
Brunei	No	No	No	No	No	No	No	
Burkina Faso	No	No	No	No	No	Yes	No	
Burma (Myanmar)	No	No	No	No	No	No	No	
Burundi	No	No	No	No	No	Yes	No	
Cambodia	No	No	No	Yes	No	Yes	No	
Cameroon	No	No	No	No	No	No	No	
Cape Verde	No	No	No	No	No	Yes	No	
Central African Republic	No	No	No	No	No	No	No	
Chad	No	No	No	No	No	Yes	No	
Chile	Yes	No	Yes	Yes	Yes (16)	Yes	Yes	
China	Yes	Yes	Yes	No	No	Yes	No	
Colombia	No	No	No	Yes	Yes (5)	Yes	Yes	
Comoros	No	No	No	No	No	Yes	No	
Congo	No	No	No	No	No	Yes	No	
Congo, DR	No	No	No	No	No	Yes	No	
Cook Islands	No	No	No	No	Yes (1)	No	No	
Costa Rica	Yes	No	Yes	Yes	Yes (3)	Yes	No	
Cote d'Ivoire	No	No	No	No	No	Yes	No	
Cuba	No	Yes	No	No	No	Yes	No	
Dem. P. Rep. of Korea	No	No	No	No	No	No	No	
Djibouti	No	No	No	No	No	No	No	
Dominica	No	No	No	Yes	Yes (1)	Yes	No	
Dominican Republic	No	No	No	Yes	Yes (2)	Yes	No	
Ecuador	No	Yes	No	No	No	Yes	No	
Egypt	No	No	No	No	Yes (1)	Yes	Yes	
El Salvador	No	No	No	Yes	No	Yes	No	
Equatorial Guinea	No	No	No	No	No	No	No	

Eritrea	No	No	No	No	No	No	No	
Ethiopia	No	No	Yes	Yes	Yes (1)	Yes	No	
Fiji	No	No	Yes	No	No	No	No	
Gabon	No	No	No	No	No	No	No	
Gambia	No	No	No	No	Yes (2)	No	No	
Georgia	No	No	No	No	Yes (1)	Yes	No	
Ghana	No	No	No	No	No	Yes	No	
Grenada	No	No	No	No	No	No	No	
Guatemala	No	No	Yes	No	No	No	No	
Guinea	No	No	No	No	No	Yes	No	
Guinea-Bissau	No	No	No	No	No	No	No	
Guyana	No	No	Yes	Yes	No	Yes	No	
Haiti	No	No	No	No	No	Yes	No	
Honduras	No	No	Yes	No	No	No	No	
India	Yes	No	Yes	Yes	No	No	Yes	
Indonesia	Yes	No	Yes	Yes	Yes (3)	Yes	Yes	
Iran	No	No	No	No	No	Yes	No	
Iraq	No	No	No	No	No	No	No	
Israel	No	No	Yes	No	No	No	No	
Jamaica	No	No	No	No	No	Yes	No	
Jordan	No	No	No	No	Yes (9)	Yes	No	
Kenya	No	No	Yes	No	Yes (2)	Yes	No	
Kiribati	No	No	No	No	No	No	No	
Kuwait	No	No	No	No	No	No	No	
Kyrgystan	No	No	No	No	Yes (1)	No	No	
Laos	No	No	No	No	Yes (1)	Yes	No	
Lebanon	No	No	No	No	Yes (2)	Yes	No	
Lesotho	No	No	No	No	No	Yes	No	

Liberia	No	No	No	No	No	No	No	
Libya	No	No	No	No	Yes (1)	No	No	
Macedonia	No	No	No	No	No	No	No	
Madagascar	No	No	Yes	No	No	Yes	No	
Malawi	No	No	No	No	No	Yes	No	
Malaysia	No	No	Yes	No	No	No	No	
Maldives	Yes	No	No	Yes	No	No	No	
Mali	No	No	No	Yes	Yes (2)	Yes	No	
Marshall Islands	No	No	Yes	Yes	No	No	No	
Mauritania	No	No	No	No	No	Yes	No	
Mauritius	No	No	No	No	No	Yes	No	
Mexico	Yes	Yes	Yes	Yes	Yes (15)	No	Yes	
Micronesia	No	No	Yes	No	No	No	No	
Moldova	Yes	No	No	No	No	Yes	No	
Mongolia	No	No	No	No	No	Yes	No	
Montenegro	No	No	No	No	No	No	No	
Morocco	No	No	No	No	Yes (3)	Yes	Yes	
Mozambique	No	No	No	Yes	No	No	No	
Namibia	No	No	Yes	No	No	Yes	No	
Nauru	No	No	No	No	No	No	No	
Nepal	No	No	Yes	No	No	No	No	
Nicaragua	No	No	No	No	No	No	No	
Niger	No	No	No	No	No	Yes	No	
Nigeria	No	No	No	No	No	No	Yes	
Niue	No	No	No	No	No	Yes	No	
Oman	No	No	No	No	No	No	No	
Pakistan	No	No	Yes	Yes	Yes (1)	No	No	
Palau	No	No	No	No	No	No	No	

Palestine	No	No	No	No	No	No	No	
Panama	No	Yes	No	No	No	No	No	
Papua New Guinea	Yes	No	No	No	No	No	No	
Paraguay	No	No	No	No	No	Yes	No	
Peru	No	Yes	Yes	Yes	Yes (6)	Yes	No	
Philippines	No	Yes	Yes	Yes	Yes (2)	Yes	Yes	
Qatar	No	No	No	No	No	No	No	
Rwanda	No	No	No	Yes	No	Yes	No	
Saint Kitts and Nevis	No	No	No	No	No	Yes	No	
Saint Vincent and the Grenadines	No	No	No	No	No	No	No	
Samoa	No	No	No	No	No	No	No	
Sao Tome and Principe	No	No	No	No	No	No	No	
Saudi Arabia	No	No	No	No	No	No	No	
Senegal	No	No	No	No	No	Yes	No	
Serbia	No	No	No	No	Yes (12)	No	No	
Seychelles	No	No	No	No	No	No	No	
Sierra Leone	No	No	No	No	No	No	No	
Singapore	Yes	No	Yes	No	No	No	No	
Solomon Islands	No	No	No	No	No	No	No	
Somalia	No	No	No	No	No	No	No	
South Africa	Yes	No	Yes	Yes	Yes (3)	Yes	Yes	
South Korea	Yes	Yes	No	Yes	No	No	Yes	
South Sudan	No	No	No	No	No	No	No	
Sri Lanka	No	No	Yes	No	No	Yes	No	
Sudan	No	No	No	No	No	Yes	No	
Suriname	No	No	No	No	No	No	No	
Swaziland	No	No	No	No	No	No	No	

Syrian Arab Republic	No	No	No	No	No	No	No	
Tajikistan	No	No	No	No	No	No	No	
Tanzania	No	No	No	No	No	No	No	
Thailand	No	No	No	Yes	Yes (1)	Yes	Yes	
Timor-Leste	No	No	No	No	No	No	No	
Togo	No	No	No	No	No	No	No	
Tonga	No	No	No	No	No	No	No	
Trinidad and Tobago	No	No	No	No	No	No	No	
Tunisia	No	No	No	Yes	Yes (2)	No	No	
Turkmenistan	No	No	No	No	No	No	No	
Tuvalu	No	No	No	No	No	No	No	
Uganda	No	No	No	Yes	Yes (2)	No	No	
United Arab Emirates	No	No	No	No	No	No	No	
Uruguay	No	Yes	Yes	No	Yes (5)	No	No	
Uzbekistan	No	No	No	No	No	No	No	
Vanuatu	No	No	No	No	No	No	No	
Venezuela	No	No	No	No	No	No	No	
Vietnam	No	No	No	Yes	Yes (2)	Yes	Yes	
Yemen	No	No	No	No	No	No	No	
Zambia	No	No	No	No	No	Yes	No	
Zimbabwe	No	No	No	No	No	No	No	

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