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Please cite this paper as:

McNicoll, L., R. Jachnik, G. Montmasson-Clair and S. Mudombi (2017), "Estimating publicly-mobilised private finance for climate action: A South African case study", *OECD Environment Working Papers*, No. 125, OECD Publishing, Paris.
http://dx.doi.org/10.1787/a606277c-en

OECD Environment Working Papers
No. 125

Estimating publicly-mobilised private finance for climate action: A South African case study

Lauren McNicoll, Raphaël Jachnik (OECD), Gaylor Montmasson-Clair and Shakespear Mudombi, Trade & Industrial Policy Strategies (TIPS)

Research Collaborative
Tracking Private Climate Finance

JEL Classification: C81, F30, G3, H23, O16, O19, Q42, Q54

OECD

TIPS
TRADE & INDUSTRIAL POLICY STRATEGIES

Unclassified **ENV/WKP(2017)12**

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development **06-Sep-2017**

English - Or. English

ENVIRONMENT DIRECTORATE

ENV/WKP(2017)12
Unclassified

Cancels & replaces the same document of 24 August 2017

ESTIMATING PUBLICLY-MOBILISED PRIVATE FINANCE FOR CLIMATE ACTION: A SOUTH AFRICAN CASE STUDY - ENVIRONMENT WORKING PAPER No. 125

by Lauren McNicoll and Raphaël Jachnik (OECD), and Gaylor Montmasson-Clair and Shakespear Mudombi, Trade & Industrial Policy Strategies (TIPS)

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Authorised for publication by Simon Upton, Director, Environment Directorate.

JEL Classification: C81, F30, G3, H23, O16, O19, Q42, Q54

Keywords: climate change, climate finance, public intervention, investment, private finance, estimation, databases, measurement, reporting

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JT03418377

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ACKNOWLEDGEMENTS

The project brought together the expertise of Trade and Industrial Policies Strategies (TIPS), an established South African economic policy think-tank, and of the Organisation for Economic Co-operation and Development (OECD). It was conducted in close collaboration with South Africa's Department of Environmental Affairs (DEA) and National Treasury (NT).

Taking advantage of the networks and established working relations of these four organisations, the project benefited from input from a range of stakeholders in order to ensure collection of data and information was as comprehensive and up-to-date as possible. These included, in particular, international and domestic public finance institutions, South African government and agencies, and key private sector actors. In this context, the authors are particularly grateful to the institutions listed in Annex 3 for their co-operation in providing and helping to interpret the data necessary to make this analysis possible, as well as to those institutions that participated in a subsequent qualitative consultation.

The authors would like to thank:

- Kelello Mashiane and Thabani Madlala (TIPS) for their research assistance;
- Colleagues Rodney Boyd, Simon Buckle, Jane Ellis, Roger Fores Carrion, Tomas Hos, Nicolina Lamhauge, Mariana Mirabile, Joanna Ribeiro, Dirk Röttgers, Cécile Sangaré, Rolf Schwarz, Robert Youngman (OECD), Peter Janoska (IEA), Saul Levin, Thabo Thulare and Christopher Wood (TIPS) for their comments at various stages of the project lifecycle;
- Delegates who provided feedback on the concepts and results that were presented at the 14 March 2016, 12 September 2016 and 13 March 2017 workshops of the OECD-led Research Collaborative on Tracking Private Climate Finance, as well as the 11 November 2016 and 2 May 2017 meetings of the OECD Working Party on Climate, Investment and Development;
- Experts who provided written comments: Rafael da Soler (Brazilian Ministry of Foreign Affairs), Lydia Cavasin (Environment and Climate Change Canada), Juan Avendano and Sebastián Lema (Colombian National Planning Department), Jean Giraud (French Ministry of Finance), Gard Lindseth (Norwegian Ministry of Climate and Environment), Jenitha Badul (South African Department of Environmental Affairs), Gabriela Blatter (Swiss Federal Office for the Environment), Florian Mante and Ophélie Risler (Agence Française de Développement), Lungile Mashele (Development Bank of Southern Africa), Lizeka Matshekga (Industrial Development Corporation of South Africa), Jessica Brown, Donovan Escalante and David Wang (Climate Policy Initiative), Malango Mughogho (The Green Directory) and Michael Westphal (World Resources Institute).

The work was funded by the OECD (through funding received from the European Commission in support of the Research Collaborative) and the Agence Française de Développement branch in South Africa. In addition, the OECD would like to express its gratitude to the governments of Austria, Canada, Norway, Switzerland, the United Kingdom and the United States for funding the work of the Research Collaborative in 2016-2017.

ABSTRACT

This study estimates and analyses publicly-mobilised private finance for climate action in South Africa, between 2010 and 2015. The mobilisation effect of public climate finance on private finance is first estimated through an analysis and attribution of project-level co-finance data. A pilot-methodology (the *investor perspective*) then expands the analysis to also incorporate the mobilisation effect of financial support provided by South African and international policies in two sectors: renewable energy and energy efficiency. Results suggest that, in the South African context, domestic public actors play the major mobilisation role by providing support through targeted policies, and to a lesser extent by committing project-level co-finance. However, even the *investor perspective* does not provide a full picture of mobilisation as the methodology does not attribute a role to finance committed by bilateral and multilateral public finance providers via upstream financial intermediaries (e.g. funds and credit lines). Further, there is qualitative evidence to suggest that capacity building activities (both international and domestic) have an indirect mobilisation effect on private finance over time. Methodological work and improved data availability are, however, required to quantify this effect.

JEL Codes: C81, F30, G3, H23, O16, O19, Q42, Q54

Keywords: climate change, climate finance, public intervention, investment, private finance, estimation, databases, measurement, reporting

RÉSUMÉ

Cette étude estime et analyse le financement privé mobilisé par l'action publique en faveur de la lutte contre le changement climatique en Afrique du Sud entre 2010 et 2015. Dans un premier temps, l'effet mobilisateur de la finance climatique publique sur la finance privée est estimé en analysant et attribuant des données de co-financement au niveau des projets. Dans un deuxième temps, une méthode pilote («le point de vue de l'investisseur») élargit le périmètre d'analyse en tenant également compte de l'effet mobilisateur du soutien financier fournit par les politiques sud-africaines et internationales dans deux secteurs : les énergies renouvelables et l'efficacité énergétique. Les résultats suggèrent que, dans le contexte sud-africain, les acteurs nationaux ont mobilisé la majorité des volumes de financement privé par le biais de politiques ciblées ainsi que, dans une moindre mesure, via leurs engagements en termes de co-financements. Cependant même «le point de vue de l'investisseur» ne fournit pas une vue complète de la mobilisation car la méthode ne permet pas d'attribuer un rôle aux engagements des acteurs bilatéraux et multilatéraux via des intermédiaires financiers (ex. fonds et lignes de crédit). De plus, des éléments plus qualitatifs permettent de mettre en avant l'effet mobilisateur indirect sur l'investissement privé dans le temps du soutien (international et national) au renforcement des capacités. Des travaux méthodologiques et de meilleures données sont, cependant, nécessaires dans ce domaine pour permettre une quantification de cet effet.

Classification JEL: C81, F30, G3, H23, O16, O19, Q42, Q54

Keywords: changement climatique, financement climatique, intervention publique, investissement, financement privé, estimation, bases de données, mesure, notification

TABLE OF CONTENTS

ACKNOWLEDGEMENTS 3
ABSTRACT 4
RÉSUMÉ 4
LIST OF ACRONYMS 8
EXECUTIVE SUMMARY 10
Methodological approach 10
Overview of findings 11
Possible ways forward to increase private finance mobilisation and improve its tracking 13
1. INTRODUCTION 14
1.1 Climate strategies and investment needs in South Africa 14
1.2 South African and international climate finance tracking efforts 15
2. METHODOLOGY AND DATA 16
2.1 Methodological approach 16
2.2 Data collection efforts 19
3. ESTIMATING PRIVATE FINANCE MOBILISED BY PUBLIC CLIMATE FINANCE 21
3.1 Overview of public-private co-financing 21
3.2 Analysing the mobilisation effect of public finance instruments and providers 25
3.3 Private finance mobilisation one level upstream through funds, funds-of-funds and credit lines 27
4. ESTIMATING THE EFFECT OF CLIMATE-RELATED CAPACITY BUILDING AND POLICY INTERVENTIONS ON PRIVATE FINANCE 30
4.1 Renewable energy 31
4.2 Energy Efficiency 43
4.3 Adaptation in the Water Sector 52
5. CONCLUSIONS AND RECOMMENDATIONS 55
5.1 Factors mobilising and hindering private finance for climate action in South Africa 55
5.2 Methodological developments to measure and report publicly-mobilised private finance 56
5.3 Data availability and gaps in the South African context 57
REFERENCES 59
ANNEXES 72
ANNEX 1. INDICATIVE LIST OF CLIMATE-RELEVANT SECTORS AND ACTIVITIES 73
ANNEX 2. OVERVIEW OF DECISION POINTS AND METHODOLOGICAL OPTIONS USED 75
ANNEX 3. PRIVATE CO-FINANCING DATA AVAILABILITY 77
ANNEX 4. COMMERCIAL DATABASE COVERAGE AND AVAILABILITY 80
ANNEX 5. DISTRIBUTION OF PRIVATE TO PUBLIC CO-FINANCE RATIOS 81
ANNEX 6. OVERVIEW OF CLIMATE-RELATED FUNDS IN SOUTH AFRICA 82

ANNEX 7. ESTIMATING A PROJECT-LEVEL VALUE OF FINANCIAL SUPPORT FOR POLICIES THAT CAN BE MONETISED 83

ANNEX 8. STAKEHOLDER CONSULTATION LIST 89

Tables

Table 1. Summary of key concepts and core methodological assumptions for each analytical approach 18
Table 2. Sources consulted to gather and consolidate climate-related co-finance commitments data 20
Table 3. Timeline of public interventions targeting private investment in the renewable energy sector in South Africa (2007-2015) 32
Table 4. Timeline of public interventions targeting private investment for energy efficiency in South Africa (2005-2015) 45
Table A1.1 Indicative list of climate-relevant sectors and activities 73
Table A2.1 Overview of decision points for analysing private finance mobilised by public finance provided at the project-level and intermediated through credit lines or funds 75
Table A2.2 Overview of decision points for analysing private finance mobilised by the combination of public co-finance and financial support provided by public policies (the investor perspective) 76
Table A3.1 Summary of private co-financing data availability and sources 77
Table A4.1 Summary of commercial database entries analysed for co-finance analysis 80
Table A6.1 Overview of climate-relevant funds active in South Africa and achieving first financial close between 2010 and 2015 82

Figures

Figure 1. Volume of mobilised private finance attributed to public finance instruments and providers according to volume-based pro-rated attribution (2010-2015, USD billions) 11
Figure 2. Volumes of mobilised private finance by sector attributed to public interventions according to volume-based pro-rated attribution under the *investor perspective* (2010-2015, USD billions) 12
Figure 3. Scopes of private finance and public interventions considered in each analytical approach 17
Figure 4. Overview of public and private co-finance for climate action in South Africa (2010-2015, USD billions) 22
Figure 5. Rolling three-year average evolution of public and private co-finance for climate action in South Africa (2010-2015, USD billions) 23
Figure 6. Volumes and weighted average ratios of public and private co-finance by sector (2010-2015, USD billions) 24
Figure 7. Share of mobilised private finance attributed to public finance instruments according to volume-based pro-rated attribution (2010-2015, percentages) 25
Figure 8. Share of mobilised private finance attributed to public finance providers according to volume-based pro-rated attribution (2010-2015, percentages) 26
Figure 9. Volumes of public and private finance at the fund-level in South Africa (2010-2015, USD billions) 27
Figure 10. Share of fund-level mobilised private finance attributed to public finance providers according to volume-based pro-rated attribution (2010-2015, percentages) 28
Figure 11. Volumes of public finance committed through credit line facilities and mobilised private finance (2010-2015, USD billions) 28
Figure 12. Share of private finance mobilised through credit lines attributed to public finance providers according to volume-based pro-rated attribution (2010-2015, percentages) 29
Figure 13. Estimate and overview of total private finance for renewable energy (2010-2015) 33

Figure 14. Overview of finance for renewable energy projects in the *investor perspective* scope (2010-2015, USD billions).....36
Figure 15. Share of mobilised private finance for renewable energy attributed to public interventions according to volume-based pro-rated attribution (2010-2015, percentages) 36
Figure 16. Share of mobilised private finance for renewable energy attributed to public actors according to volume-based pro-rated attribution (2010-2015, percentages) 37
Figure 17. Three-year rolling average of private finance and public finance for capacity building activities in the renewable energy sector (Capacity building 2005-2015, Other 2010-2015).....41
Figure 18. Estimate and overview of total private finance for energy efficiency (2010-2015).....46
Figure 19. Overview of finance for energy efficiency projects in the *investor perspective* scope (2010-2015, USD billions).....47
Figure 20. Share of mobilised private finance for energy efficiency attributed to public interventions according to volume-based pro-rated attribution (2010-2015, percentages) 48
Figure 21. Three-year rolling average of private finance and public finance for capacity building activities in the energy efficiency sector (Capacity building 2005-2015, Other 2010-2015) 49
Figure A5.1 Illustration of the variability of private-public co-finance ratios for selected projects (2010-2015) 81
Figure A7.1 Evolution of REIPPPP auction prices for solar and wind alongside Eskom's average electricity tariff (2011-2015, ZAR/kWh).....84
Figure A7.2 Share of mobilised private finance in the renewable energy sector attributed to public interventions according to volume-based pro-rated attribution, across valuations of the REIPPPP (2010-2015, percentages) 85
Figure A7.3 Share of mobilised private finance attributed to public finance instruments according to volume-based pro-rated attribution, across discount rates (2010-2015, percentages) 87
Figure A8.1 Indicative question from the qualitative consultation for the energy efficiency sector.....89

Boxes

Box 1. Project-level case study of the KaXu Concentrating Solar Power installation 39
Box A7.1 Analysis of the sensitivity of results for the renewable energy sector to the valuation of the recurring REIPPPP payments 84
Box A7.2 Analysis of the sensitivity of results for the renewable energy sector to the choice of discount rate 87

LIST OF ACRONYMS

AFD	Agence Française de Développement (France)
AfDB	African Development Bank
BAAM	Business-Adopt-a-Municipality
BNEF	Bloomberg New Energy Finance
BP	British Petroleum
BRT	Bus Rapid Transit
BUR	Biennial Update Report
CaBEERE	Capacity Building Project in Energy Efficiency and Renewable Energy
CCRED	The Centre for Competition, Regulation and Economic Development
CDB	China Development Bank (China)
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFL	Compact Fluorescent Lamp
CoGTA	Department of Cooperative Governance
CMA	Catchment Management Agencies
CPI	Climate Policy Initiative
CRS	Creditor Reporting System (OECD)
CSP	Concentrated Solar Power
CTF	Clean Technology Fund
DAC	Development Assistance Committee (OECD)
DANIDA	Danish International Development Agency
DEA	Department of Environmental Affairs (South Africa)
DBSA	Development Bank of Southern Africa
DEG	Deutsche Investitions und Entwicklungsgesellschaft
DFID	Department for International Development (United Kingdom)
DKK	Danish Kroner
DoE	Department of Energy (South Africa)
DPP	Development partnerships with the private sector
DSM	Demand-side management
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation (South Africa)
EEDSM	Energy Efficiency Demand Side Management
EEP	Energy and Environment Partnership
EIB	European Investment Bank
ELI	Efficient Lighting Initiative
ESCO	Energy Service/Savings Companies
EUR	Euros
FIT	Feed-in-tariff
FMO	Financierings-Maatschappij voor Ontwikkelingslanden (Netherlands)
GBP	Pound Sterling
GEF	Global Environment Facility
GHG	Greenhouse gas
GIZ	Gesellschaft für Internationale Zusammenarbeit (Germany)
GW	Gigawatt
GWh	Gigawatt hour
IDRC	International Development Research Centre
IEA	International Energy Agency
IEE	Industry Energy Efficiency
INDC	Intended Nationally Determined Contribution
IDC	Industrial Development Corporation (South Africa)
IFC	International Finance Corporation
IPP	Independent power producer
IRENA	International Renewable Energy Agency
IRP2010	Integrated Resource Plan for Electricity
IWE	Industrial Water Efficiency
JBIC	Japanese Bank for International Cooperation
KfW	Kreditanstalt für Wiederaufbau (Germany)
kWh	Kilowatt hour
LED	Light Emitting Diode
LTAS	Long-Term Adaptation Scenario
MCEP	Manufacturing Credit Enhancement Programme

MRV	Measurement, reporting and verification
MTPPP	Medium Term Power Purchase Programme
MW	Megawatt
MWh	Megawatt hour
NCCRWP	National Climate Change Response White Paper
NCPC-SA	National Cleaner Production Centre
NGO	Non-Governmental Organisation
NEES	National Energy Efficiency Strategy
NERSA	National Energy Regulator of South Africa
NSSD1	National Strategy for Sustainable Development and Action Plan 2011-2014
NRCS	National Regulator for Compulsory Specifications
NT	National Treasury (South Africa)
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OFID	OPEC Fund for International Development
OPEC	Organization of the Petroleum Exporting Countries
OPIC	Overseas Private Investment Corporation
PNCP	Pilot National Cogeneration Programme
PPA	Power purchase agreement
PPP	Public-private partnership
PSEE	Private Sector Energy Efficiency
RECORD	Renewable Energy Centre of Research and Development
RECP	Resource Efficiency and Cleaner Production
REFIT	Renewable Energy Feed-in-Tariff
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
REMT	Renewable Energy Market Transformation
SABS	South African Bureau of Standards
SADC	Southern African Development Community
SAGEN	South African-German Energy
SALGA	South African Local Government Association
SANBI	South African National Biodiversity Institute
SANEDI	South African National Energy Development Institute
SAPOA	South African Property Owners Association
SAREC	South African Renewable Energy Council
SARETEC	South African Renewable Energy Technology Centre
SAWEP	South African Wind Energy Programme
SDC	Swiss Agency for Development and Cooperation
SIP	Strategic Integrated Project
SOE	State-owned enterprise
SOLTRAIN	Southern African Solar Thermal & Demonstration Initiative
SSEG	Small-scale Embedded Generation
SWH	Solar Water Heating
SWPN-SA	Strategic Water Partners Network South Africa
TCTA	Trans-Caledon Tunnel Authority
the dti	Department of Trade and Industry (South Africa)
TIPS	Trade & Industrial Policy Strategies
TR	Thomson-Reuters
UEIP	uMngeni Ecological Infrastructure Partnership
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organisation
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollars
WACC	Weighted Average Cost of Capital
WRI	World Resources Institute
WWF-SA	World Wildlife Fund South Africa
ZAR	South African Rand

EXECUTIVE SUMMARY

There is an increasing urgency for countries to transition to climate-compatible development pathways. This is particularly relevant for an emerging economy such as South Africa, which is both one of the most carbon-intensive in the world and vulnerable to the effects of climate change (DEA and SANBI, 2013a, 2013b; IEA, 2014a; World Bank, 2016a; Ziervogel et al., 2014). As illustrated in its intended nationally determined contribution (INDC) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) (DEA, 2015a), large investments are required for South Africa to mitigate and adapt to the effects of climate change, including a substantial contribution from the private sector. Tracking both public and private climate finance, as well as estimating the mobilisation effect of climate-related public interventions on private investment, is needed to evaluate progress and inform effective public action.

South Africa has made significant efforts to track public climate finance, such as through the ongoing development of a Climate Change Response Monitoring and Evaluation System. At the international level, tracking climate finance provided and mobilised for climate action in developing countries is key for monitoring progress towards the USD 100 billion a year by 2020 commitment made by developed countries. This study builds upon but also expands existing efforts by exploring data and methodologies for estimating private finance mobilised for climate action in South Africa between 2010 and 2015 by a range of domestic and international public interventions. In particular, it represents a step forward in improving the ability to quantify the mobilisation effect on private investment of targeted climate policies resulting in project-level public financial support.

Methodological approach

The analysis follows two quantitative approaches.

- **The first approach estimates the mobilisation effect of domestic and international public climate finance through an analysis of project-level co-finance** (see Annex 1 for an indicative list of climate-relevant sectors and activities). This follows the approach used in several previous studies (e.g. OECD, 2015, Stumhofer et al., 2015). Data was collated from both primary sources (exchanges with public finance providers, OECD Development Assistance Committee's (DAC) surveys) and secondary sources (commercial databases, public announcements). This approach assumes that project-level public co-finance fully mobilises private co-finance and applies a volume-based attribution across all public finance instruments and providers. The role of upstream financial intermediaries (namely funds and credit lines) is considered separately in an instrument-specific analysis and a project example, which adds a layer of depth and helps put in perspective the results from the analysis of project-level co-finance.

- **The second approach (the *investor perspective*) expands the analysis to, in addition to project-level co-finance, also incorporate the role of public financial support provided through targeted policies**. It focuses on the renewable energy and energy efficiency sectors, which are governed by diverse policy frameworks. Data for projects that received such support was collected, for the majority, from government departments and then combined with co-financing data collected under the first approach, while avoiding double counting. On that basis, the *investor perspective* approach assumes that private finance is mobilised by the combination of public co-finance and financial support through policies. A volume-based attribution is again applied. A third sector, water, is investigated using a qualitative approach, due to challenges in obtaining project-level private finance data.

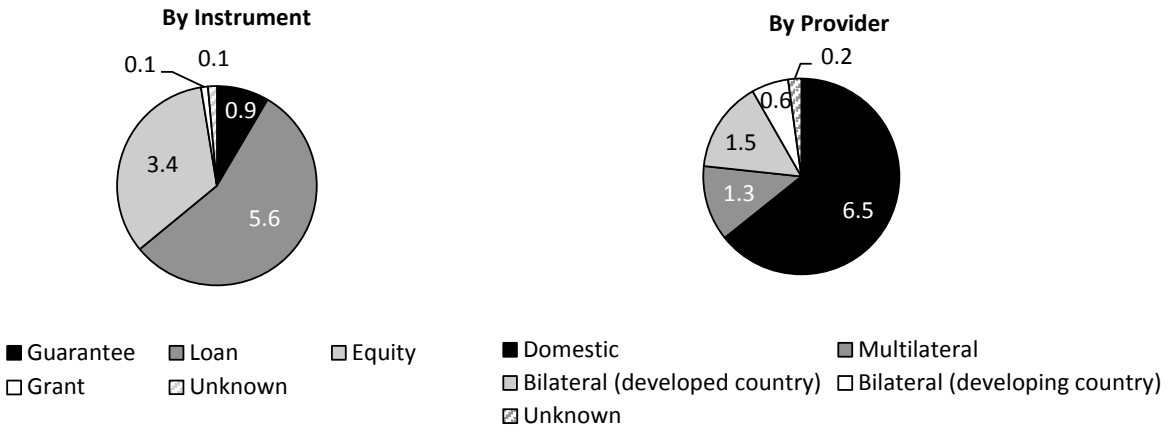
A prerequisite for conducting this two-step analysis was the availability of at least partial data on private investment from international actors and national-level public finance providers as well as from policy implementers. However, national-level actors and most international actors do not yet systematically or consistently track climate-related co-finance. Commercial databases were, therefore, used to complement primary data, although such databases cover only the largest projects and often do not include breakdowns of individual providers of finance. As such, manual and time-consuming processing and reconciliations between multiple data sources were needed to aggregate data for analysis.

To help put results into perspective, the likely indirect mobilisation effect of climate-related capacity building activities on private finance is qualitatively evaluated. Insights are drawn from available literature, indications from observed relationships between volumes of public finance for capacity building and of private finance, and a consultation with key stakeholders.

Overview of findings

Under the first approach, an attribution of private co-finance according to the volume of public co-finance committed indicates that domestic actors play the major mobilisation role. Between 2010 and 2015, South African public co-finance is estimated to have mobilised 64% out of a total of USD 10.1 billion (ZAR 95.4 billion)[1] (Figure 1). This is particularly the case for South African development banks such as the Development Bank of Southern Africa (DBSA) and the Industrial Development Corporation (IDC). As debt typically represents the largest source of funding in a project finance structure, a volume-based attribution suggests that loans are the key mobilising instrument. A comprehensive risk-based attribution is currently unfeasible due to data limitations but doing so would increase the share of mobilised private finance attributed to public equity investments. In terms of sectors, renewable energy attracted by far the largest share (85%) of private co-finance.

Figure 1. Volume of mobilised private finance attributed to public finance instruments and providers according to volume-based pro-rated attribution (2010-2015, USD billions)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

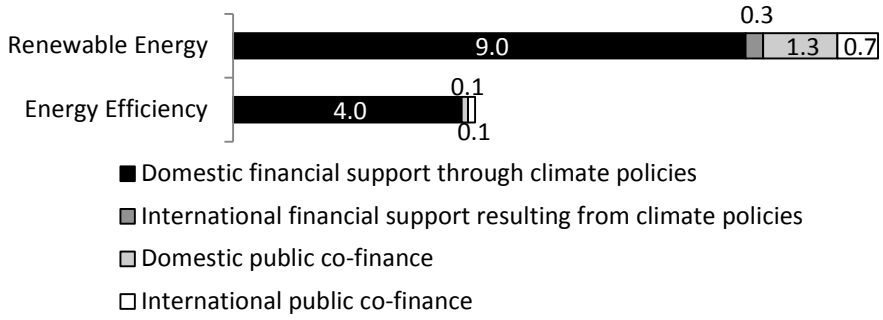
[1] Volumes of finance are presented in USD and ZAR throughout the report. Conversions use annual OECD exchange rates (see https://data.oecd.org/conversion/exchange-rates.htm) for the year in which the finance was committed. If the year of commitment is unknown or not applicable, the conversion uses the 2015 annual exchange rate.

Instrument- and project-specific analyses, however, indicate that international actors play a complementary mobilisation role through upstream fund-level investments and credit lines, although volumes are very limited compared to project-level private finance mobilisation. This highlights that a comprehensive analysis of the mobilisation effect of public finance needs to be conducted across the financial value chain. However, a careful and likely time-consuming attribution methodology needs to be applied when doing so, as estimates of mobilisation through funds and credit lines are not necessarily additional to estimates of mobilised private finance at the project-level as presented above.

Under the second approach (the *investor perspective*), volumes of private finance mobilised by financial support through domestic policies are estimated to considerably outweigh volumes of private finance mobilised by public co-finance for both renewable energy and energy efficiency (Figure 2). Mobilisation by financial support resulting from international policies, namely the Clean Development Mechanism (CDM), is comparatively small. These results are, however, context specific and cannot be transferred or generalised as other developing countries do not necessarily have equivalent domestic policies providing financial support for climate projects.

In the renewable energy sector, the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), a national-level reverse auction system introduced in 2011 that provides 20-year guaranteed power purchase agreements for commercial installations, plays the most significant role by far. This conclusion holds true across a range of methodological assumptions for valuing recurring financial support provided by the REIPPPP (see Annex 7). In the energy efficiency sector, two tax incentives providing one-off upfront subsidies to commercial enterprises for energy efficiency improvements in greenfield and brownfield installations are estimated to mobilise 95% of private finance.

Figure 2. Volumes of mobilised private finance by sector attributed to public interventions according to volume-based pro-rated attribution under the *investor perspective* (2010-2015, USD billions)



Note: Mobilisation by international policies, namely the Clean Development Mechanism (CDM), is not estimated for energy efficiency due to a lack of available granular data to accurately perform the attribution.
Source: Analysis by authors based on data from a consultation with national financiers and policy-makers/implementers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), IPP Office (2016) and public announcements.

Results also underline differences between sectors. For renewable energy, public co-finance is estimated to mobilise 18% of private finance (and financial support provided by policies mobilises 82%), while this share is less than 5% for energy efficiency. Further, for renewable energy, public interventions, including co-finance and the REIPPPP, are combined to jointly support private finance mobilisation for (mostly large-scale) commercial installations. By contrast, in the energy efficiency sector, public interventions tend to each provide support to and mobilise private finance for different types and sizes of projects. In the water sector, incentives for climate adaptation-related private investment appear to be lacking, especially at the industry and household level. Financing is regularly raised for bulk water infrastructure, however, such projects fall outside the time scope and definition of climate activities (Annex 1) of the present analysis.

There is some evidence to suggest that climate-related international and domestic capacity building has had an indirect mobilisation effect on private investment. For instance, bilateral support for energy efficiency audit programmes has helped to identify profitable investment opportunities in small- and medium-size commercial enterprises which have then benefited from tax incentives for energy efficiency improvements. Quantifying the effect of such support on private finance remains challenging due to data limitations and methodological difficulties e.g. accounting for time delays. However, available literature, insights from a consultation with public and private stakeholders, and observed relationships between key data series indicate that capacity building for policy development may have indirectly mobilised private finance over time, while capacity building for industry implementation may have had a more rapid effect.

Possible ways forward to increase private finance mobilisation and improve its tracking

The South African example points to the need to turn attention to mobilising private finance outside energy-related activities, including by empowering sub-national actors. As renewable energy projects become increasingly commercially viable, including as a result of domestic policies and technology cost reductions, public co-finance could be progressively redirected to play a more decisive risk-reducing role in other climate-related sectors. In South Africa, investments to adapt to the water-related effects of climate change could be unlocked by further mainstreaming climate change issues into national water policies. Further, financial incentives could be provided at the level of provinces or municipalities to households or enterprises for private investment in water conservation and demand management.

In terms of methodologies, identifying practical approaches for taking into account both risk and volume when attributing mobilised private finance would more accurately reflect the role played by various public finance instruments and providers (domestic or international alike). Such developments could also improve coverage if they enable the measurement of private finance mobilised through financial intermediaries such as funds and credit lines, while avoiding double counting with project-level estimates of mobilisation. There are notable on-going efforts in this area, in particular by the OECD DAC, which is progressively developing such methodologies for collecting and reporting data internationally on private finance mobilised by development finance instruments.

From a South African perspective, the important mobilisation role of domestic public finance could be highlighted in relevant reporting channels, building on methodological developments at the international level when doing so. Such channels include, domestically, the Climate Change Response Monitoring and Evaluation System as well as, internationally, Biennial Update Reports to the UNFCCC. In order to improve the currently-limited availability of required private finance data, the national government should consider conducting capacity building and awareness raising across providers of climate-relevant public finance, including at regional and municipal levels.

Beyond the measurement and reporting of private finance mobilised by public finance, **the *investor perspective* tested in the present study represents a partial step forward towards building numerical evidence on the transformational role of policies**. Further work could be undertaken to conceptualise the approach as well as to test it in other climate-relevant sectors and different county contexts. To this end, for **countries interested in undertaking similar analysis, relevant ministries and agencies should strengthen efforts to initiate collection of granular data on private investments resulting from policies that provide financial support to climate-related projects**. Pending improved data availability, future work may also continue to explore methods and indicators to estimate and report on the indirect mobilisation effect that climate-related capacity building activities have on private finance.

1. INTRODUCTION

1.1 Climate strategies and investment needs in South Africa

As the impacts of climate change appear more pressing and damaging, the urgency for countries to transition to climate-compatible development pathways is growing. This transition requires redirecting financial flows towards low-carbon, climate-resilient activities, in line with the objectives of the Paris Agreement of the United Nations Framework Conference on Climate Change (UNFCCC) (United Nations, 2015). This is notably the case for South Africa. On the one hand, it is one of the most carbon- and energy-intensive economies with over 90% of electricity generation from coal, accounting for 1.3% of global greenhouse gas (GHG) emissions (World Bank, 2016a; IEA, 2014a). On the other hand, South Africa is vulnerable to the impacts of climate change, such as increasing occurrence and severity of droughts, and sea-level rise (DEA and SANBI, 2013a, 2013b; Ziervogel et al., 2014).

South Africa has made important strides towards addressing climate change, building on the country's Constitution which recognises sustainable development as a human right. The 2011 National Climate Change Response Policy White Paper (NCCRWP) presented a vision for a transition to a climate-resilient and lower-carbon economy and society (DEA, 2011a). The two main objectives are to effectively manage inevitable climate change impacts through interventions that build and sustain South Africa's resilience and emergency response capacity, and to make a fair contribution to the global effort to stabilise GHG concentrations in the atmosphere. Such a vision is realised through a host of government actions including those now consolidated under the Near-Term Priority Climate Change Flagship Programmes which have the potential to significantly advance South Africa's response to climate change (DEA, 2015b). The vision has been reiterated in the country's National Development Plan: Vision 2030 (NPC, 2011) and National Strategy for Sustainable Development and Action Plan 2011-2014 (NSSD1) (DEA, 2011b), as well as South Africa's Intended Nationally Determined Contribution (INDC) submitted to the UNFCCC (DEA, 2015a).

In line with this vision, the South African national government allocated an estimated ZAR 141 billion (USD 11 billion)[2] to environmentally-related programmes in the country between 2011 and 2015 (DEA, 2016). For example, the Department of Environmental Affairs' (DEAs') ZAR 1.1 billion (USD 0.1 billion) Green Fund, administered by the Development Bank of Southern Africa (DBSA), aims to provide "catalytic finance to facilitate investment in green initiatives that will support South Africa's transition towards a green economy" (DEA and DBSA, 2012). The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is another illustration of the progress made in recent years in South Africa (DoE, NT and DBSA, 2016). Since 2011, it has procured more than 6 GW of renewable energy-based generation capacity,[3] building on lessons learnt from the previous unsuccessful trials of three independent power producer procurement programmes and a Renewable Energy Feed-in-Tariff (REFIT) (Montmasson-Clair, Moilwa and Ryan, 2014).

However, substantially more investment is required to achieve South Africa's climate change-related goals. In the context of preparing the INDC, incremental climate finance requirements for mitigation over the period 2010-2050 were estimated in a number of areas: ZAR 3 490 billion (USD 274 billion) to decarbonise

[2] Volumes of finance are presented in USD and ZAR throughout the report. Conversions use annual OECD exchange rates (see https://data.oecd.org/conversion/exchange-rates.htm) for the year in which the finance was committed. If the year of commitment is unknown or not applicable, the conversion uses the 2015 annual exchange rate.

[3] To provide perspective, total installed on-grid capacity in South Africa was 45 GW by end 2012 (IEA, 2014b).

the electricity supply, ZAR 5 130 billion (USD 402 billion) for the rollout of electric vehicles, and ZAR 4 880 billion (USD 382 billion) for the rollout of hybrid vehicles. In terms of adaptation, requirements for planning, capacity building and monitoring and evaluation are estimated at ZAR 1.7 billion (USD 0.1 billion) (DEA, 2015a). Further studies estimated adaptation-related costs over the 2011-2050 period to reach ZAR 3 657 million (USD 287 million) in the water sector and ZAR 1 766 million (USD 138 million) in natural resource management (Midgley, Scholes and Blignaut, 2011).

Meeting these investment needs requires increased participation from the private sector. Public finance and policy interventions are, in this respect, key to mobilise and catalyse private investments, including by shifting investments away from climate-incompatible activities. Tracking climate finance and estimating the extent to which various types of public interventions have mobilised private finance for climate action to date is, therefore, critical to assess progress made as well as inform future public action.

1.2 South African and international climate finance tracking efforts

Attempts have been made in South Africa to take stock of domestic and international public finance in support of climate activities (Faure, 2009; GTAC, 2016; Hemraj, 2012; Montmasson-Clair, 2013; Naidoo, 2012; NBI and KPMG, 2013; Zingel, 2011).[4] In addition, the South African government, led by DEA, is working to establish a Climate Change Response Monitoring and Evaluation System which comprises a climate finance component. The system is being designed with the aim of being operationalised in 2017-2018 (Letete, 2015). It aims to combine top-down and bottom-up monitoring, by tracking public finance from sources, implementing agencies and project implementers. To complement these initiatives, gaining an understanding of the scale of private climate finance, and particularly of the interplay between climate-related public interventions and private investments, is required.

At the international level, tracking public and private finance for climate action is a key task in monitoring progress towards addressing climate change mitigation and adaptation. In the context of the UNFCCC, tracking efforts and reporting requirements to date have mainly focused on public climate finance provided by developed countries to developing countries. By extension, this has also been the case of work to estimate publicly-mobilised private climate finance, i.e. by developed countries for climate action in developing countries. Starting from the perspective of an emerging economy, the present analysis takes a more holistic approach by considering a wide range of domestic and international public finance and policy climate-related interventions.

In addition to providing an estimate of publicly-mobilised private finance for climate projects in South Africa, the paper aims to contribute towards better understanding how such projects were funded, as well as the role of climate-related capacity building and policy interventions by both domestic and international actors. As such, the project intends to feed into on-going efforts in South Africa to improve the measurement of (private) climate finance and understanding of its drivers, including for the purpose of reporting to the UNFCCC in the context of the Biennial Update Reports (BURs). The analysis will also contribute to the growing body of work developed under the OECD-led Research Collaborative on Tracking Private Climate Finance that explores data and methodologies for estimating publicly-mobilised private finance for climate action.

[4] The estimates of domestic and international public climate finance in such studies are not comparable to estimates presented in the current analysis due to different time boundaries and project scopes. Most notably, the current study gathered data only for projects that have been co-financed by both public and private actors, while previous estimates of public climate finance typically include funding for public-only projects.

2. METHODOLOGY AND DATA

This study estimates and analyses publicly-mobilised private finance for climate mitigation and adaptation purposes in South Africa over the time period 2010 to 2015 (see Annex 1 for an indicative list of climate-related sectors and activities). In this context, "publicly-mobilised private finance" refers to private finance that has been invested as a result of climate-related domestic or international public finance, capacity building activities or policies. Claiming such mobilisation requires demonstrating or making plausible assumptions about the causal relationship between public interventions and observed volumes of private finance. This report explores options to do so in the South African context by building upon and expanding on-going international efforts to gather data and develop methodologies in this area. Such efforts, in particular, include work conducted since 2013 under the Research Collaborative on Tracking Private Climate Finance.

2.1 Methodological approach

Analysis is divided into two parts reflecting currently available data and methodologies for measuring and estimating mobilisation. The first part focuses on the mobilisation effect of public finance, while the second part pilots the *investor perspective* methodology, which also considers mobilisation by policies that provide direct project-level financial support. In addition, a more qualitative assessment of the indirect role of capacity building activities is pursued. The methodological decisions are described fully in Annex 2, through the lens of the Research Collaborative four-stage framework of decision points (Jachnik, Caruso and Srivastava, 2015). A summary is provided in the remainder of this Section and Table 1.

Following the approach in several previous studies (e.g. OECD, 2015, Stumhofer et al., 2015), Chapter 3 analyses the mobilisation effect of domestic and international public finance for all climate-relevant sectors, based on project-level co-finance data. "Public co-finance" refers to public sector funds invested directly alongside private sector funds at the project-level. Such finance typically takes the form of grants, loans (concessional and non-concessional), equity or guarantees and can help to lower risks and costs for the private sector (Corfee-Morlot et al., 2012; Polycarp, Brown and Fu-Bertaux, 2013; Venugopal et al., 2012). A key assumption under this approach is that public finance fully mobilises all private co-finance at the project-level. Estimates of mobilised private finance are then attributed to public co-finance providers and instruments according to the volume of finance provided by each.

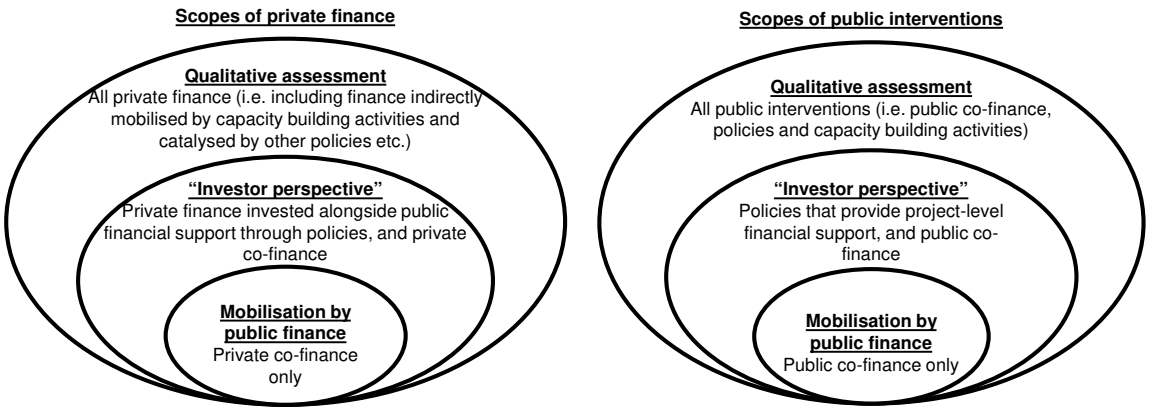
Public co-finance can also be intermediated through funds and credit lines (revolving loans), upstream from downstream project-level private investment. The mobilisation effect of public finance committed to such vehicles is analysed separately to avoid the risk of double counting with estimates of project-level mobilisation. The methodologies applied draw on those developed by the OECD Development Assistance Committee (DAC) and findings from Brown et al. (2015). For funds, it is assumed that private finance committed during the first fund-raising period is mobilised by public finance in the same fund-raising period. For credit lines, it is assumed that private finance committed through top-up funds by the local financing institution or end-borrower equity is mobilised by public finance committed through the credit line vehicle. In both cases, a volume-based attribution is applied.

However, considering only project-, fund and credit line-level public finance does not provide a complete picture of mobilised private finance. On the one hand, private investments made in the absence of public finance, but as a result of public policies and capacity building activities are not captured. On the other hand, for any given amount of private finance considered, too much importance may be attributed to

public finance since the role of capacity building activities and policies are not taken into account. The second part of this study, therefore, explores possibilities to relax the assumption that public co-finance fully mobilises private co-finance by also incorporating the effect of capacity building and policies (Chapter 4). It, however, does not seek to estimate and assess the costs and hidden barriers that private investors may face. Three sectors are considered for this analysis (renewable energy, energy efficiency and water), which were selected for their diverse policy contexts.

For the renewable energy and energy efficiency sectors, a pilot-methodology (the *investor perspective*) expands the analysis of mobilisation by public finance to also incorporate the effect on private finance of financial support through policies (such as tax incentives). The absence of relevant policies and data prevented applying a similar methodological approach for the water sector which is, instead, analysed more qualitatively. The *investor perspective* is so-named as it considers public interventions that have a positive impact on expected cash-flows over the lifespan of a project. The scope of private finance and public interventions considered in the analysis is correspondingly expanded as shown in Figure 3. Data for projects that received financial support through policies was collected and then combined with co-financing data collected under the first approach, while avoiding double counting (see Section 2.2).

Figure 3. Scopes of private finance and public interventions considered in each analytical approach



Source: Authors.

The *investor perspective* assumes that private finance is mobilised by the combination of project-level public co-finance and financial support provided to projects through policies. Private finance is then attributed to public interventions following a volume-based pro-rating approach (as for the analysis of mobilisation by public finance). In terms of assigning a financial value to policies, face value is used for those that provide a one-time financial incentive. However, for policies that provide multiple or recurring financial support or incentives over time (e.g. electricity power purchase agreements), the time value of money principle must be considered. According to this principle, cash flows in the present are worth more than cash flows in the future, assuming that the interest rate is greater than zero. In general, the discounted present value for a stream of cash flows R_t provided by a policy at time periods $t = 0, \ldots, N$ with discount rate i is defined as follows (IMF, 2003).

$$\text{Discounted present value} = \sum_{t=0}^{N} \frac{R_t}{(1+i)^t}$$

Annex 7 details the actual calculations and underlying assumptions for valuing the policies considered in this analysis for the renewable energy and energy efficiency sectors. The annex also presents the results of

a sensitivity analysis to the choice of discount rate (i) and value of the recurring policy-related cash-flow stream (R_t).

Table 1. Summary of key concepts and core methodological assumptions for each analytical approach

Approach	Scope of public intervention(s) considered	Scope of private finance considered	Causality assumption	Attribution method
Approach 1: Mobilisation by public finance (Chapter 3)	Public co-finance (grants, loans, equity, guarantees).	Private co-finance.	Public co-finance mobilises all private co-finance at the project-level.	Volume-based: Mobilised private finance is attributed to public finance providers and instruments according to the volume of public co-finance provided through each channel.
	Public finance through financial intermediaries: i) Funds and funds-of-funds: Public finance provided in first funding round. ii) Credit lines: all public finance provided through the vehicle.	i) Funds and funds-of-funds: Private finance in the first funding round. ii) Credit lines: Top-up funds by local financing institution (if private) and end-borrower equity.	i) Funds and funds-of-funds: Public finance mobilises all private finance in the first funding round. ii) Credit lines: Public finance mobilises local financing institution's top-up funds (if private) and end borrower equity.	Volume-based (as above).
Approach 2: The *investor perspective* (Chapter 4)	Public co-finance and financial support through policies (e.g. tax incentives, power purchase agreements).	Private co-finance and private finance invested alongside financial support through policies.	The combination of public co-finance and financial support through policies mobilises private finance at the project-level.	Volume-based: Mobilised private finance is attributed to public finance providers/instruments and policies according to the volume of public finance support provided through each channel.
Qualitative assessment	All public interventions (i.e. public co-finance, financial support through policies, other regulatory policies, capacity building activities).	All private finance (i.e. private co-finance, private finance invested alongside financial support through policies, private finance mobilised indirectly and catalysed by other public interventions).	No assumption made (qualitative assessment only).	No attribution (qualitative assessment only).

Source: Authors.

As summarised in Table 1, a qualitative approach is used to assess the potential indirect mobilisation effect of capacity building activities (such as support for policy development and implementation, or industry implementation and project demonstrations including technical assistance) for all three focus sectors. Such activities typically occur several steps upstream from private investment meaning it is more

difficult to make plausible causal assumptions and quantify their effect on private finance. Insights into such possible effects are drawn from: (i) available literature; (ii), evidence from observed relationships between volumes of public finance for capacity building activities and estimates of private finance over time; and (iii) a consultation with key stakeholders on the role of the various public interventions and enabling factors (see Annex 8). Such stakeholders include public and private sector organisations that have provided finance, capacity building support, and/or contributed to the development and implementation of policies.

2.2 Data collection efforts

2.2.1 Public-private co-financing data

The OECD DAC's statistics on official development finance were among the main sources used to identify multilateral and bilateral actors active in financing climate-related projects in South Africa likely to attract private co-finance. Relevant domestic national and subnational actors were identified through a screening and consultative process. Following a comprehensive mapping of public finance institutions at national, provincial and municipal levels, which was informed by prior analytical work (Das Nair, Montmasson-Clair and Ryan, 2014; Montmasson-Clair, 2013; Montmasson-Clair, Moilwa and Ryan, 2014; Montmasson-Clair and Ryan, 2014), each institution was contacted to ascertain its relevance to the scope of the project.

Data was collected through four key avenues as described in Table 2. First, primary data on climate-related co-financing commitments (including private) were collected from public finance providers identified through the afore-described mapping process (see Annex 3). Second, this was supplemented with primary data collected from bilateral and multilateral actors through recent DAC surveys on mobilised private finance (Benn et al., forthcoming, 2016).[5] While many public finance providers have made progress over recent years to develop climate finance tracking systems, several emphasised that these types of exercises remain challenging. Specific challenges include identifying climate-related projects outside of renewable energy or separating out the climate-related share of particular projects, as well as the current absence of systematic tracking of private co-finance. As a result, the time frame for analysis of 2010 to 2015 reflects realistic data availability.

Where primary data remained incomplete or unavailable, secondary data sources were used as a complement. Four commercial investment databases were consulted: Bloomberg New Energy Finance (BNEF), Dealogic, IJGlobal and Thomson-Reuters. While BNEF focuses on renewable energy projects (above 1MW in size), the other three databases cover infrastructure investments more broadly. From a starting point of 675 entries across databases (with overlapping projects), 252 entries were deemed relevant after excluding projects that were not climate-related or which were of poor data quality (see Annex 4). Overall, commercial databases were used to supplement primary data for approximately 40 projects which involved public co-finance. A further 30 projects were identified that were purely privately-financed but benefited from financial support through policies and are, therefore, included in the *investor perspective* analysis of Chapter 4. Finally, where available and relevant, publicly-available data (e.g. from press releases and online project descriptions) was also used.

[5] See www.oecd.org/dac/.

Table 2. Sources consulted to gather and consolidate climate-related co-finance commitments data

Data Type	Data Source
Primary	Authors' own data collection from public finance providers
	OECD DAC surveys on mobilised private finance
Secondary	Commercial databases (BNEF, Dealogic, IJGlobal, Thomson Reuters)
	Desktop research (press releases, online project descriptions etc.)

Source: Authors.

A manual and time-consuming reconciliation across primary and secondary data sources was required. Primary data was taken as a starting point and any gaps (such as names of co-investors and volumes of co-finance provided by each) were deduced or estimated where possible using information from secondary sources. This process highlighted some significant discrepancies between data sources, as actors take 'snapshots' of co-finance commitments at different times. In some cases, an informed judgement call was required to reconcile such differences. Overall, the estimates of private co-finance presented in this report are derived from best-available data but should be considered partial.

2.2.2 Public capacity building and policy data

Sector-specific capacity building and policy interventions were identified through a literature review and then narrowed to those with a likely mobilisation effect on private finance (see Sections 4.1, 4.2, 4.3). This process was carried out using insights from a range of actors active in capacity building and policymaking, including bilateral and multilateral aid providers, national government departments and agencies, provincial development agencies and municipalities.

For the renewable energy and energy efficiency sectors, all policies that could be translated into financial support at the project-level (and for which data was available) were included in the *investor perspective* analysis. South African national departments (mainly the National Treasury (NT), the Department of Energy (DoE) and the Department of Trade and Industry (dti)) facilitated access to quantitative data on volumes of public finance committed through each policy and on the total value of private investments having benefited from such policies. Complementary use was made of publicly-available databases, such as the International Energy Agency (IEA) and International Renewable Energy Agency (IRENA) Joint Policies and Measures database (IEA and IRENA, 2016), the OECD Environmental Policy database (OECD, 2016a), IPP Projects database (IPP Office, 2016) and Clean Development Mechanism (CDM) pipeline (UNEP DTU, 2017a, 2017b). In general, policy-related financial data was more readily accessible (or estimable) for renewable energy than energy efficiency. No relevant policies, and corresponding data, were identified for water. Annex 7 provides further detail on the specific data that was collected or estimated for analysis alongside corresponding sources.

Capacity building activities were analysed at sector- rather than at project-level since such activities typically take place upstream from private investments and may have an indirect mobilisation effect over time and across a number of projects depending on the nature and target of the intervention. To account for a possible delayed or long-lasting effect, capacity building activities between 2005 and 2015 are considered. Climate-related Official Development Assistance (ODA) to South Africa between 2005 and 2015, sourced from the OECD DAC Creditor Reporting System (CRS) (2016), was used as a proxy for volumes of international finance committed to capacity building activities in each sector investigated. Where possible, this was supplemented by volumes of domestic finance committed to capacity building activities sourced from publicly available sources, such as case studies by the National Cleaner Production Centre's (NCPC) (NCPC-SA, 2014), and the closure report for the Private Sector Energy Efficiency (PSEE) project (NBI, 2016)).

3. ESTIMATING PRIVATE FINANCE MOBILISED BY PUBLIC CLIMATE FINANCE

Key messages

The total value of climate-related projects benefiting from public and private co-finance commitments in South Africa between 2010 and 2015 is estimated at USD 17.4 billion (ZAR 170.6 billion) with slightly over half from private actors (USD 10.1 billion/ZAR 95.4 billion) and slightly under half from public actors (USD 7.3 billion/ZAR 75.2 billion). The majority of private sector co-finance was provided by commercial banks through debt instruments, while project developers filled the equity gap.

Average annual volumes of private co-finance increased from USD 1.6 billion (ZAR 12.7 billion) in 2010-2012 to USD 1.8 billion (ZAR 19.1 billion) in 2013-2015. The renewable energy sector attracted by far the largest share (85%) of private co-finance. Very little private co-finance could be identified for adaptation-related projects, although this is in part due to data limitations e.g. for small-scale investment in water efficiency.

Assuming public co-finance fully mobilises private co-finance and applying a volume-based attribution suggests that domestic public finance mobilised 64% of private co-finance, or USD 6.4 billion (ZAR 59.0 billion). Consistent with typical project financing structures, which consist in more debt than equity, public loans enabled more private finance than any other instrument. Pure volume-based attribution does not, however, take into account the higher risk taken by equity providers, which is an area for further data and methodological work.

Bilateral and multilateral public finance providers play a further role, albeit limited, in mobilising private investment at the level of upstream financial intermediaries (funds and credit lines). Pending improved data availability, further consideration of such upstream instruments would help put in perspective the conclusions from analysing project-level co-finance data.

This chapter estimates and analyses private finance mobilised by public climate finance based on project-level co-finance data from 2010 to 2015 (see Chapter 2 for methodological details). The mobilisation effect of public finance intermediated through funds and credit lines is analysed separately in Section 3.3, while the role of public policy and capacity building activities is not explored until Chapter 4.

3.1 Overview of public-private co-financing

This section presents aggregate volumes of total public and private co-finance, over time and by sector (no attribution at this stage). It is important to note that estimates presented do not include projects funded wholly by either public finance (out of scope) or private finance (included in Chapter 4 when considering the effect of capacity building and policies).

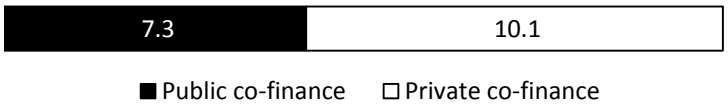
3.1.1 Aggregate summary

Overall, data collection efforts identified 218 climate-related projects (see Annex 1) in South Africa between 2010 and 2015. [6] Of the 218 projects, 108 had both public and private co-finance and were of

[6] Where it was impossible or unrealistic to source project-level financial data, the terminology "project" can refer to a more aggregated estimate. For example, each year of the DFID Energy and Environment Partnership (EEP) programme is considered as one "project" despite involving multiple individual investments.

satisfactory data quality (and are therefore considered in this analysis).[7] As shown in Figure 4, the total value of these 108 projects amounts to USD 17.4 billion (ZAR 170.6 billion), out of which USD 10.1 billion (ZAR 95.4 billion) is private finance (slightly over half of the total), with public actors having contributed USD 7.3 billion (ZAR 75.2 billion).

Figure 4. Overview of public and private co-finance for climate action in South Africa (2010-2015, USD billions)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

In terms of actors, data suggests that commercial banks (primarily domestic, such as Nedbank, Standard Bank and First Rand Bank) provided USD 6.5 billion (ZAR 60.9 billion), or 64%, of the total USD 10.1 billion (ZAR 95.4 billion) private co-finance. In terms of instruments, debt was most commonly provided and represents USD 7.2 billion (ZAR 68.4 billion), or 71% of the total. By contrast, private firms (often project developers such as Abengoa and Solar Reserve) provided around a quarter of the private co-finance mainly through equity sponsorship. Project-level private investment by funds is comparatively low at USD 0.5 billion (ZAR 5.0 billion), or 5% of the total. Moreover, as illustrated in Section 3.3.1, upstream private finance mobilisation at the fund-level appears to also be limited.

3.1.2 Temporal view

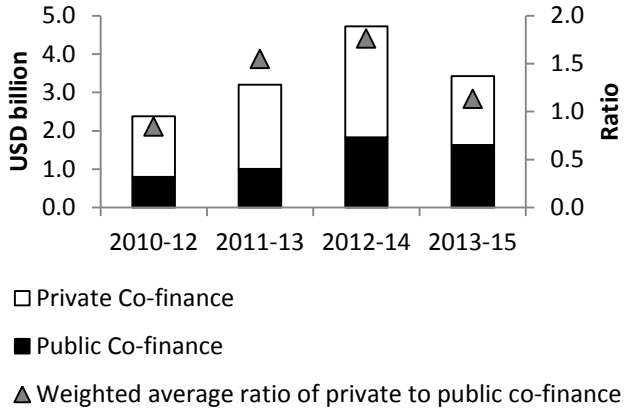
Between 2010-12 and 2013-15, average volumes of private co-finance increased from USD 1.6 billion (ZAR 12.7 billion) to USD 1.8 billion (ZAR 19.1 billion) (Figure 5).[8] The decrease from a peak of USD 2.9 billion (ZAR 27.2 billion) in 2012-14 can largely explained by falling installation costs and an increase in the number of projects with private financiers only, which are excluded from the current view but analysed in Chapter 4.

The ratio of private to public co-finance is also shown in Figure 5; weighted according to the project-level investment size, such that projects with a larger total investment are more heavily weighted than those with a smaller total investment. Observed ratios vary even more significantly for underlying individual projects with an average of 2.7 and standard deviation of 5.6 (see Annex 5 for a scatter plot overview). In general, the data suggests that projects with a lower total investment value tend to attract a lower proportion of private sector co-finance. Moreover, larger renewable energy projects (total investment value greater than USD 50 million) tend to attract higher proportions of private sector co-finance compared to non-renewable energy projects of a similar investment value.

[7] Out of the 110 projects identified but not included in the analysis, 30 were financed by private actors only (no public co-finance), 32 by public actors only (no private co-finance), while disaggregated financial data could not be sourced for the remaining 48.

[8] Since this analysis considers financial commitments rather than disbursements, a rolling three-year average is displayed to reduce annual variability due to large projects.

Figure 5. Rolling three-year average evolution of public and private co-finance for climate action in South Africa (2010-2015, USD billions)



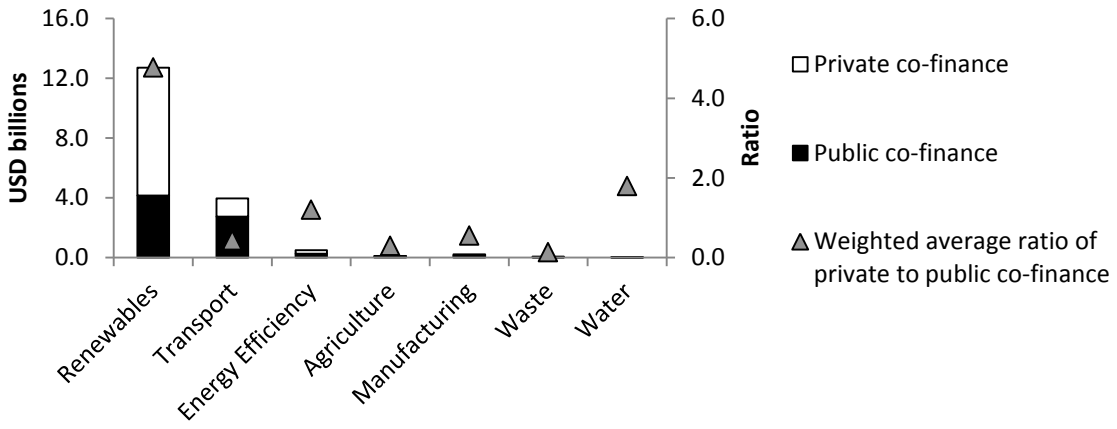
Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

Figure 5 should be considered in the context of currently limited but continuously improving co-finance data availability. Indeed, several public finance providers cited incomplete tracking as a constraint to accessing historical co-finance data. As a result, part of the observed increase in co-finance between 2010-12 and 2013-15 may be explained by ongoing improved tracking of climate-related financial flows. In future, considering a longer time horizon may result in more meaningful trend analysis, including to analyse and characterise the nature of private finance e.g. whether private ownership (equity investments) by historically disadvantaged groups of society in renewable energy projects is increasing; one of several developmental outcomes that the IDC has recently aimed at promoting.

3.1.3 Sector view

As illustrated in Figure 6, both total volumes of private co-finance (USD 8.5 billion/ZAR 77.9 billion) and the weighted average ratio of private to public co-finance (4.8) are significantly higher in the renewable energy sector compared to all others. It follows that mitigation-related activities account for the vast majority of climate-related private co-finance (99%). It should be noted that, in Figure 6, the full financial value for projects spanning more than one sector is counted in each sector that is relevant. Consequently, aggregating volumes across sectors would result in double counting.

Figure 6. Volumes and weighted average ratios of public and private co-finance by sector (2010-2015, USD billions)



Note: For projects that span more than one sector, the full financial value is counted in each one. As a result, aggregating volumes across sectors would result in double counting.

Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

Several factors help to explain the variation between sectors in terms of volumes of co-finance and ratios of private to public co-finance:

- First, investments may be underestimated in sectors where climate-relevance is less-well defined (e.g. for sectors outside of renewable energy). For instance, energy efficiency investments are usually only identifiable on a case-by-case basis as they occur in numerous sectors (such as residential buildings and manufacturing) and are often part of wider upgrades. Outside of the renewable energy sector, results from the current analysis are based on very few data points.

- Second, the relatively short timeframe may not be representative of longer-term trends in sectors where investments are large but infrequent. For example, while water infrastructure and transport investments in the early-2000s (such as the Gautrain rapid rail network[9]) were often financed through public-private-partnerships (PPPs), more recent projects (such as the development of bus rapid transit (BRT) systems[10]), have almost exclusively been publicly financed.

- Third, relatively small-scale investments in sectors like energy efficiency or agriculture are unlikely to attract public co-finance (except for grant-matching programmes). By contrast, these may benefit from public finance intermediated through credit lines (Section 3.3) or public financial support through policy interventions and capacity building (Chapter 4).

[9] See www.gautrain.co.za/about.

[10] BRT systems have been financed by national grant and municipal budgets, complemented by fare collection. City of Johannesburg's Rea Vaya system is an exception, as it also benefitted from export credit from the Brazilian Development Bank (BNDES) for the procurement of Brazilian buses.

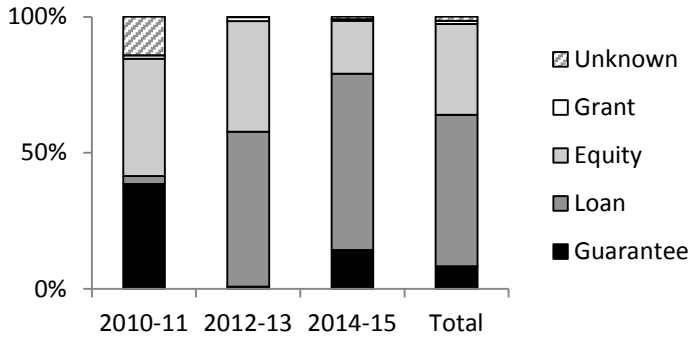
3.2 Analysing the mobilisation effect of public finance instruments and providers

Using the co-finance estimates from Section 3.1, this section assumes that public co-finance fully mobilises private co-finance. It applies a volume-based pro-rating to attribute mobilisation to public finance instruments and providers.

3.2.1 Instrument type breakdown and analysis

A volume-based attribution assigns 56% of the total USD 10.1 billion (ZAR 95.4 billion) private co-finance to public loans (Figure 7).[11] This reflects that larger volumes of public finance are provided through loans compared to any other instrument, and is consistent with a typical project financing structure which consists in more debt than equity finance (EIB, 2015a). As most renewable energy projects follow such a financing structure, it follows that an increasing share of mobilised private finance is attributed to loans following introduction of the REIPPPP in 2011. A comprehensive risk-based attribution is currently unfeasible due to data limitations in identifying finance at detailed levels of the capital structure (such as senior debt, subordinated debt, and mezzanine), but doing so would increase the share of mobilised private finance attributed to public equity investments.

Figure 7. Share of mobilised private finance attributed to public finance instruments according to volume-based pro-rated attribution (2010-2015, percentages)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

The mobilisation role of guarantees and grants was more challenging to assess:

- In contrast to results from the OECD DAC Surveys (Benn et al., forthcoming, 2016), guarantees are attributed a relatively low mobilisation role in the present analysis, since few climate-related project-level guarantees were identified overall. While survey data collected by the DAC proved to be a useful data source, commercial databases tend not to have information on guarantees. Further, export credit guarantees are excluded from this view due to data confidentiality and methodological issues that are yet to be addressed. It should also be noted that only guarantees provided by public finance institutions for specific projects are considered here, and not policy-related guarantees (e.g. power purchase agreements (PPAs) under the REIPPPP), which are explored in Chapter 4.

[11] Due to data limitations, it is not possible to make a distinction between stand-alone and syndicated loans for all projects.

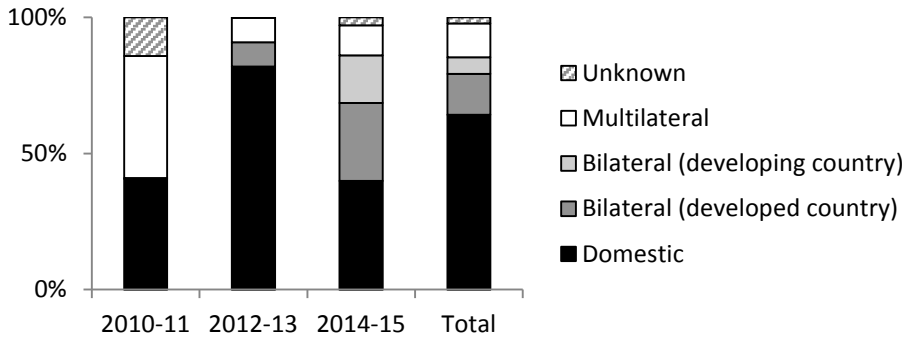
- Grant finance is typically provided in smaller quantities than debt or equity finance meaning the mobilisation effect appears small at the aggregate level when following a volume-based attribution. However, an analysis of specific grant-matching programmes (such as the DFID Energy and Environment Partnership (EEP) and the dti's Manufacturing Competitiveness Enhancement Programme (MCEP)) suggests that, on average, one dollar of public grant finance mobilised approximately 1.8 dollars of private co-finance.

3.2.2 Provider-type break down and analysis: domestic, bilateral, multilateral

A volume-based attribution suggests that domestic public finance providers mobilised USD 6.5 billion (ZAR 59.0 billion), or 64% of the total USD 10.1 billion (ZAR 95.4 billion) private co-finance (Figure 8). Consistent with the findings of Climate Policy Initiative's (CPI's) Landscape of Climate Finance (Buchner et al., 2015), this reflects that domestic public actors provide larger volumes of project-level public co-finance compared to bilateral and multilateral actors. This is the case for at least three reasons. First, South Africa has a number of large and well-established public institutions providing climate finance, in particular DBSA and IDC. Second, domestic public actors tend to finance a large number of small-to-medium size projects in which it would be less economical for international bilateral and multilateral actors to participate.[12] Third, the number of bilateral and multilateral institutions active in South Africa is relatively limited, as shown in Annex 3.

Bilateral public co-finance from non-traditional donor country institutions (mostly China Development Bank and Bank of China) plays an increasingly important role. A volume-based attribution suggests that these institutions mobilised USD 0.6 billion (ZAR 6.6 billion), or 17%, of private finance in 2014-15. This, however, coincided with a reduction in domestic public co-finance, particularly for renewable energy projects.

Figure 8. Share of mobilised private finance attributed to public finance providers according to volume-based pro-rated attribution (2010-2015, percentages)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

As with the instrument view above, applying an alternative attribution methodology may generate different conclusions. For example, pure volume-based attribution does not take into account the higher risk taken by equity providers. Nevertheless, it is observed that domestic public actors (such as IDC and DBSA) contributed the highest volumes of public equity finance (USD 1.7 billion/ZAR 18.4 billion out of USD 1.9 billion/ZAR 20.5 billion, or 89%). It can be estimated that USD 2.5 billion (ZAR 23.3 billion) of the total USD 10.1 billion (ZAR 95.4 billion) mobilised private finance is attributable to domestic public

[12] Around 60% of the projects considered in the analysis have a total investment value of less than USD 50 million (ZAR 0.6 billion).

equity. Since equities typically form the riskiest tranche of the capital structure, the conclusion drawn above about the pivotal role of domestic public finance would likely be coherent across volume- and risk-based attribution methods.

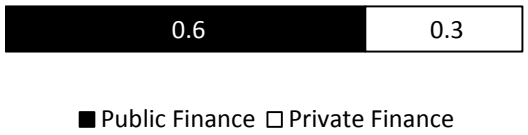
3.3 Private finance mobilisation one level upstream through funds, funds-of-funds and credit lines

This section provides a complementary prism of analysis to Section 3.2 by considering the mobilisation effect of public finance intermediated through funds and credit lines found one level upstream from the project level (see Brown et al., 2015). Such analysis reflects that mobilisation of private finance occurs at multiple levels of the financial value chain. The instrument-specific approaches applied are adapted from the methodologies being developed by the OECD DAC for measuring private finance mobilised by official development finance interventions (see Section 2.1 and Annex 2 for details).

3.3.1 Analysing fund-level mobilisation

The data collection exercise described in Section 2.2 identified 13 climate-relevant funds and funds-of-funds that achieved first financial close between 2010 and 2015 (see Annex 6 for details). Only seven of these are included in the subsequent analysis; two are excluded due to a lack of disaggregated financial data and four are out of scope since they have public investors only. At first close, the estimated capitalisation of the seven funds is USD 0.9 billion (ZAR 7.9 billion) with approximately two thirds from public actors and one third from private actors (Figure 9). Most funds invest in South Africa as part of a wider regional focus. Further, target sectors are diverse including resilient infrastructure (African Infrastructure Investment Fund II), energy-efficient housing (International Housing Solutions II) and off-grid renewable energy access (Energy Access Ventures).

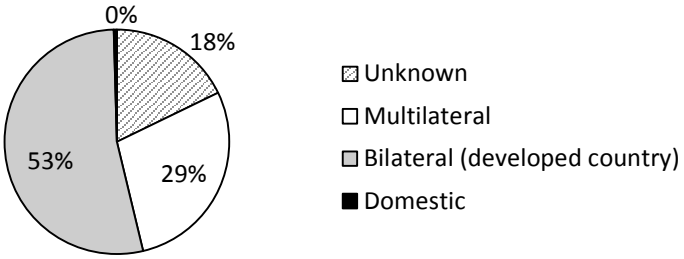
Figure 9. Volumes of public and private finance at the fund-level in South Africa (2010-2015, USD billions)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

A volume-based attribution (Figure 10) suggests that bilateral public actors play a larger role in mobilising private finance at the fund-level compared to multilateral and domestic actors. This is driven, in particular, by bilateral agencies such as the United Kingdom's CDC Group and the United States' Overseas Private Investment Corporation (OPIC).

Figure 10. Share of fund-level mobilised private finance attributed to public finance providers according to volume-based pro-rated attribution (2010-2015, percentages)



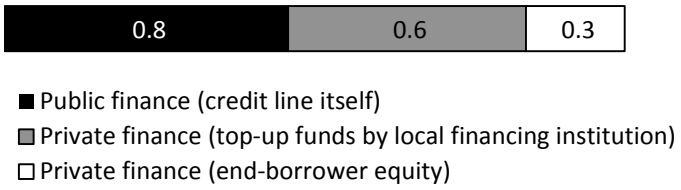
Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

3.3.2 Analysing the mobilisation effect of credit lines

Data collection identified 22 credit lines targeting renewable energy or energy efficiency in South Africa between 2010 and 2015.[13] As such, all target (in full or in part) mitigation activities while none relevant to adaptation were identified. Data availability allows for a partial estimation of mobilised private finance for 18 which, therefore, form the basis for analysis. Examples include: (i) A EUR 120 million (USD 133 million) credit line provided by Agence Française de Développement (AFD) to IDC and two South African private banks (Absa and Nedbank, the third and fourth largest commercial banks in South Africa in terms of assets) for on-lending to renewable energy and energy efficiency projects (AFD, 2011); (ii) A USD 250 million (ZAR 3.2 billion) credit line from the Japanese Bank for International Cooperation (JBIC) and Mizuho Bank to Standard Bank (currently the largest bank in the country in terms of assets) for renewable energy investments (JBIC, 2015).

The total public finance value of the credit lines considered in this analysis is USD 0.8 billion (ZAR 7.9 billion). An estimated USD 0.9 billion (ZAR 9.2 billion) of private finance was mobilised; 70% in top-up funds (debt) by the local financing institutions and the remainder in end-borrowers' equity (Figure 11). Approximately USD 0.4 billion (ZAR 4.6 billion) of this mobilised private finance can be considered additional to the estimate of USD 10.1 billion (ZAR 95.4 billion) private co-finance from Section 3.2. This is because such private finance relates to individual projects that, while benefiting from the on-lending made possible by the credit line, did not involve project-level public co-finance. By contrast, approximately USD 0.5 billion (ZAR 5.2 billion) is already accounted for in the project-level analysis, as it relates to end projects that also benefited from public co-finance.

Figure 11. Volumes of public finance committed through credit line facilities and mobilised private finance (2010-2015, USD billions)

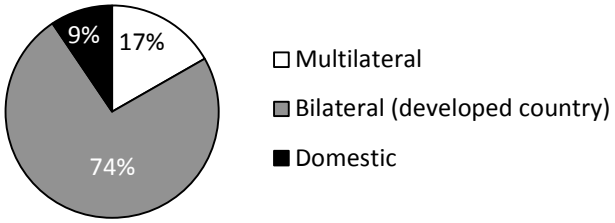


Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

[13] At least three of these are non-revolving sources of finance (i.e. upstream loans) although the analytical approach followed is the same as for revolving sources of finance (i.e. credit lines).

Most credit lines were extended to public (rather than private) local financing institutions in South Africa, which may themselves have had a mobilisation effect on equity finance by the end-borrower through the provision of top-up-funds. An attribution of the total mobilised private finance is required in those cases. Applying a volume-based pro-rating suggests that bilateral and multilateral actors mobilised USD 0.8 billion (ZAR 8.3 billion) or 91% of the private finance (Figure 12).

Figure 12. Share of private finance mobilised through credit lines attributed to public finance providers according to volume-based pro-rated attribution (2010-2015, percentages)



Source: Analysis by authors based on data from a consultation with bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015) , publicly-available press releases.

Overall, the analysis of funds and credit lines adds another layer of depth to the conclusions reached in Section 3.2. While domestic public actors play the major role in mobilising private finance at the project-level, the analysis in this section suggests that international actors play a more important role through upstream financial intermediaries. However, volumes of private finance mobilised through both funds and credit lines is very limited compared to project-level private finance mobilisation.

4. ESTIMATING THE EFFECT OF CLIMATE-RELATED CAPACITY BUILDING AND POLICY INTERVENTIONS ON PRIVATE FINANCE

Key messages

Estimates highlight that the effect on private finance of financial support provided through domestic public policies heavily outweighs that of project-level public finance for the renewable energy and energy efficiency sectors. In the renewable energy sector, the REIPPPP plays the dominant role in mobilising private finance for large-scale installations, whereas tax incentives for commercial greenfield and brownfield projects have been instrumental for energy efficiency. Mobilisation by financial support resulting from international climate policies, namely the CDM, is comparatively small.

Renewable energy-related public co-finance (equity, debt) and policy interventions (mainly the REIPPPP) tend to be combined to jointly mobilise private finance for large-scale investments. In contrast, energy efficiency-related public interventions (public co-financing in the form of mainly loans and grants, as well as tax incentives) tend to each provide support to and mobilise private finance for different types and sizes of projects.

In the water sector, significant private finance is regularly raised for bulk water infrastructure projects. It is, however currently not possible to estimate mobilised private finance for climate-, and in particular, adaptation-related activities. While several capacity building activities may have encouraged dispersed adaptation-related private investments, existing policies do not provide clear incentives for private investment at the industry and household level.

Capacity building provided by both international and domestic actors has helped shape South Africa's climate-related policy and industry context. Combined insights from available literature, a consultation with key stakeholders, as well as observed relationships between volumes of public finance for capacity building activities and private finance suggest that such activities have had an indirect mobilisation effect on private investment over time.

In addition to mobilising private finance through the provision of project-level public finance, public actors can use other types of interventions to this end, such as providing financial incentives through policies or building capacity and skills. This chapter first presents a partial estimate of total private finance for two focus sectors, namely renewable energy and energy efficiency, based on available data including estimates of private co-finance from Chapter 3. An analysis of the effect of support policies and capacity building activities on private finance is then conducted on the basis of the approaches introduced in Section 2.1. The water sector is analysed through a qualitative approach only, due to the absence of relevant project-level data and policies.

Beyond climate-related public interventions, broader enabling conditions also play a role in facilitating or hindering private investment (Ang, Röttgers and Burli, 2017; Haščič et al., 2015). These factors include the domestic policy environment (e.g. legal framework, investment promotion and facilitation, public governance aspects), as well as country-risk and -opportunity factors (e.g. political stability, structural demand). Over the time period considered, South Africa is, for instance, characterised by the existence of a mature and deep domestic private finance services industry compared to most other African countries (AfDB, 2015; The Banking Association of South Africa, 2014; IMF, 2014) as well as a relative attractiveness for foreign direct investment (A.T. Kearney, 2016).[14] The South African government

[14] Recent trends, however, require a word of caution: a sharp decline of FDI to South Africa in 2015 (UNCTAD, 2015) is highlighted by the country's falling position on the AT Kearney FDI Confidence index. While South Africa held the 11th position out of the top 25 rated countries in 2012 and 13th in 2014, it dropped off the list in 2015. Further, according to the 2015 EY Africa Attractiveness survey, FDI flows into new green- and brown-field projects in South Africa declined in 2015 for a second consecutive year (EY, 2016).

is also actively engaged in investment promotion and facilitation, notably through the establishment of special economic zones and industrial parks.[15] In addition, provincial agencies (such as Western Cape's GreenCape and the Gauteng Infrastructure Financing Agency) as well as large municipalities support feasibility studies, project development and fund-raising/deal making. The role played by such enabling conditions could not be accounted for in the quantitative analyses performed in this chapter. While they formed part of the consultation, responses did not yield conclusive insights.

4.1 Renewable energy

Although installed renewable energy capacity has increased rapidly from 0.2 GW at end 2010 to 2.4 GW at end 2015, electricity from renewable resources still accounted for less than 1% of generation as of end 2014 (IEA, 2014a). This remains far from the government's target of 17.8 GW installed capacity and 9% electricity generation from renewable resources by end 2030. Nevertheless, South Africa's commitment to renewable energy has been expressed through many channels including the 2010 Integrated Resource Plan for Electricity, and more recently the 2015 INDC submitted under the UNFCCC (DEA, 2015a). Further, the Renewable Energy Flagship Programme, which was introduced in the 2011 NCCRWP, consolidates actions (including many of those discussed in this section) with the potential to significantly advance progress in developing renewable energy (DEA, 2015b).

Table 3 displays a timeline of capacity building activities and policies that were identified as likely enablers of private investment in the renewable energy sector. Relevant interventions are further described later in this section and included in the *investor perspective* analysis or qualitative assessment as indicated by the colour coding in the figure.

[15] Two climate-relevant special economic zones are in the pipeline, respectively for green industries in Atlantis in the Western Cape and solar-based technologies in Upington in the Northern Cape.

Table 3. Timeline of public interventions targeting private investment in the renewable energy sector in South Africa (2007-2015)

Category	2007	2008	2009	2010	2011	2012	2013	2014	2015
Capacity building for policy development and implementation	Renewable Energy Market Transformation (REMT)								
					GIZ-supported discussions on NERSA guidance for SSEG schemes by municipalities				
					South African-German Energy Programme (SAGEN)				
							Regulatory Entities Capacity Building		
Capacity building for industry implementation and project demonstration		South African Wind Energy Partnership I (SAWEP I)							
		Darling wind demonstration							
			Wind Atlas for South Africa project						
					Lethabo & Kendal Solar PV demo				
						Southern African Solar Thermal Training & Demonstration Initiative (SOLTRAIN)			
								Solar Technology Roadmap	
									SAWEP II
Domestic IPP Programmes	Pilot National Cogeneration Programme (PNCP)								
		Multi-Site Baseload IPP							
		Medium Term Power Purchase Agreement							
			Renewable Energy Feed-in-tariff (REFIT)						
					Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)				
Domestic fiscal policies			Electricity levy on non-renewable resources						
			Tax Exemption under Section 12K of Income Tax Act for amounts received/accrued upon disposal of Certified Emission Reductions (CERs)						
						Accelerated Depreciation Allowance for Renewable Energy Technologies			
Domestic incentives to non-commercial installations		National Solar Water Heating (SWH) Incentive							
					Municipal support schemes for small-scale embedded generation (SSEG)				
International policy	Clean Development Mechanism (CDM)								

	No effect on private investment estimated
	Mobilisation effect estimated using the *investor perspective* approach
	For inclusion in future estimation using the *investor perspective* pending data availability
	Analysed qualitatively at aggregate sector-level

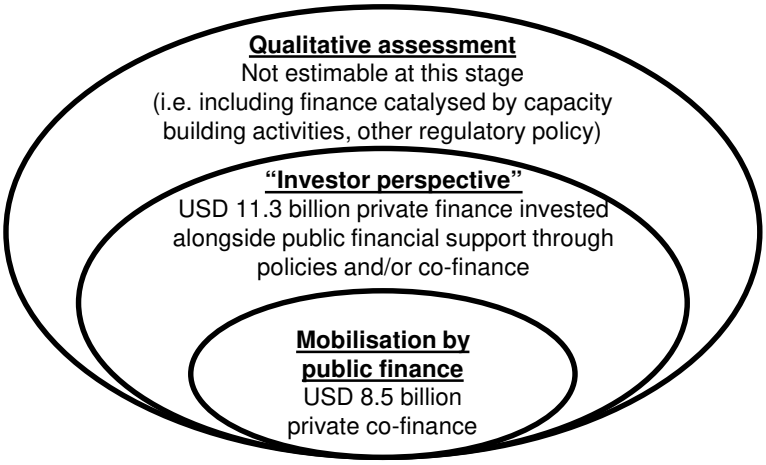
Source: Authors.

4.1.1 Partial estimate of total private finance

Based on available data, it was possible to identify USD 11.3 billion (ZAR 106.9 billion) private finance for renewable energy projects in South Africa over the period 2010 to 2015. As shown in Figure 13, this includes USD 8.5 billion (ZAR 77.9 billion) private co-finance from the first analytical approach in Chapter 3 (most of which was also invested alongside financial support through policies), plus an additional USD 2.8 billion (ZAR 29.0 billion) private finance that only benefited from financial support provided by policies (no public co-finance). The USD 11.3 billion, therefore, forms the scope for analysis using the *investor perspective* methodology.

Of this USD 11.3 billion (ZAR 106.9 billion) private finance, 61% (USD 6.9 billion/ ZAR 61.7 billion) was provided by commercial banks and 36% (USD 4.2 billion/ZAR 39.2 billion) by project developers/sponsors. The available data confirms the expected in terms of commercial banks mainly providing finance through loans, and highlights that project developers typically commit equity. Private finance commitments by funds, private foundations (such as community trusts) and unknown private actors are small in comparison at around USD 1.0 billion (ZAR 9.3 billion).

Figure 13. Estimate and overview of total private finance for renewable energy (2010-2015)



Note: The USD 8.5 billion estimate of private co-finance includes projects which may have benefited from financial support through policies. At this stage, it is not possible to provide a realistic estimate of private investments made in the absence of policies and/or co-finance (e.g. which may have been indirectly mobilised by capacity building support). It was possible to identify a further USD 0.9 billion which would fall into this category, although this does not include small-scale investments for which data could not be sourced.

Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), IPP Office (2016), UNEP DTU (2017a, 2017b) and public announcements.

As an indication of data coverage, 70% of the commercial-scale renewable energy projects (66 of the 92) and 65% of the corresponding GW (4.0 out of 6.2) procured under the REIPPPP by end-2015 are included in this estimate of finance (see DoE, NT and DBSA, 2016; IPP Office, 2016). The remaining 26 projects (2.2 GW capacity), representing an estimated ZAR 50 billion (USD 5.4 billion) investment, are not included either because financial close had not been reached at end-2015, disaggregated financial data could not be sourced, or because they did not involve any private finance.

4.1.2 Estimation of the effect on private finance of public policies that can be translated into financial support: the investor perspective

Overview of policies considered in the analysis

Four domestic policies and one international policy were identified for inclusion in the *investor perspective* analysis as they result in financial support at project-level and data could be sourced or estimated with confidence. The domestic policies are: (i) the **Renewable Energy Independent Power Producer Procurement Programme (REIPPPP);** (ii) an **accelerated depreciation allowance for renewable energy assets;** (iii) an **electricity levy for non-renewable resources;** and (iv) a **tax exemption on proceeds from the sale of Certified Emissions Reductions** (CERs) derived by projects registered under the CDM. The international policy identified is the **CDM itself.**

Domestic Policies

In the early 2000s, the government laid the foundations for renewable energy technologies to be integrated into South Africa's electricity supply by acknowledging the need for private sector participation in order to increase competition and lower prices. Between 2007 and 2010, three independent power producer (IPP) procurement programmes were trialled, namely the Pilot National Cogeneration Programme (PNCP), the Medium Term Power Purchase Programme (MTPPP) and the Multisite Baseload IPP Programme (Montmasson-Clair, Moilwa and Ryan, 2014). A Renewable Energy Feed-in-Tariff (REFIT) was also established in 2009. Although no agreements were ever reached under these programmes, their failures influenced and informed the successful design of the **REIPPPP** (Montmasson-Clair, Moilwa and Ryan, 2014). The REIPPPP was launched in 2011 and consists of the following three main elements (DoE, 2015; Eberhard, Kolker and Leighland, 2014; Hemraj, 2016; 2014; IEA and IRENA, 2016; IRENA, 2013, OECD, 2013; WWF-SA, 2014):

1. A reverse auction mechanism, which awards contracts to project developers, based on the combined criteria of price and economic development benefits, such as job creation and local content.

2. 20-year inflation-linked PPA contracts between successful bidders and Eskom, the state owned power company, which form the basis upon which investment is secured for proposed projects.

3. An explicit government guarantee from NT covering payment of all renewable energy PPAs signed by Eskom under the REIPPPP.

This analysis estimates the project-level value of the REIPPPP policy according to the discounted present value of the guaranteed PPAs (see Annex 7). While the scheme was originally limited to renewable energy projects, tenders for coal, gas and co-generation were released between 2014 and 2016 (financial close not yet reached), meaning the approach for analysing the effect of this policy may require modifications in future. Renewable energy tenders are, in general, suffering from increased resistance from Eskom due to its perceived high cost in comparison to coal (TIPS, 2017).

The 2006 Environmental Fiscal Reform Paper (NT, 2006) outlined a framework upon which to develop market-based instruments in support of environmental policies and targets. Building on this foundation, the NT has since introduced an **electricity levy for non-renewable generation** with a capacity greater than 5MW. As of 2015, the levy was ZAR 3.5c/kWh (USD 0.3c/kWh (Hemraj, 2016; OECD, 2016a). For commercial-scale renewable energy installations (such as those commissioned under the REIPPPP), the discounted present value of the levy over the expected lifetime of the plant can be considered as an implicit project-level subsidy (see Annex 7).

Further, in 2009, the Taxation Laws Amendment Act introduced a new section 12K into the Income Tax Act. It consists of a **tax exemption on the proceeds from the sale of CERs derived by projects registered under the CDM**. The aim was to stimulate the uptake of CDM projects in South Africa. The exemption was initially granted from 2009 to 2012, but was extended to 2020, in line with the adoption of the second commitment period of the Kyoto Protocol (Steenkamp, 2016b).

Finally, in 2012, the NT introduced an **accelerated depreciation allowance for renewable energy assets** which permits greater deductions in earlier years.[16] It allows 50% of the original asset cost to be depreciated in year one, 30% in year two, 20% in year three and 0% in each subsequent year of the expected useful life. This compares with a linear ("straight line") counterfactual for non-renewable energy-related assets (SARS, 2017; Steenkamp, 2016a). Due to the time value of money, deferring tax liabilities is financially beneficial, and can be estimated using a discounted present value as shown in Annex 7. Although outside the timeframe considered in this report, it is relevant for future analysis that the scheme was modified in 2016 to offer a 100% tax deduction in the first year only for solar PV installations of less than 1MW, in a bid to encourage the deployment of small-scale installations, which are becoming increasingly cost-competitive (Steenkamp, 2016b).

International Policy

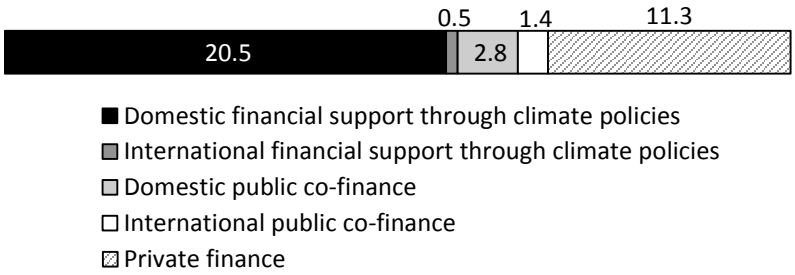
The **CDM** was established in 2009 under the Kyoto protocol of the UNFCCC to offer countries with emission reduction obligations some flexibility in meeting their targets. The mechanism awards CER credits, measured in tonnes of CO_2 avoided, to qualifying emission reduction projects in developing countries. The CERs can be sold to public or private sector organisations in developed countries to contribute towards their emission reduction targets, usually through a 7 or 10 year contract at a pre-determined price (UNEP DTU, 2017a; UNFCCC, 2017). For qualifying renewable energy projects in South Africa, the CDM policy, therefore, results in a recurring cash-flow, for which a discounted present value can be calculated (see Annex 7). It should be noted that, due to data limitations, not all renewable energy-related CDM projects could be included in the present analysis, such as those relating to solar water heating or rooftop solar. Due to a significant fall in the price of carbon, from USD 14.4/tCO_2 in 2010 to USD 7.7/tCO_2 in 2015 for European Emission Allowances (EUA) (Sandbag, 2017), the relevance of this mechanism is likely to have decreased over the timeframe in this analysis.

Results of the investor perspective *analytical approach*

Of the USD 11.3 billion (ZAR 106.9 billion) private finance included in the *investor perspective* analysis (Figure 13 above), the vast majority was committed to large-scale commercial installations, alongside a combination of public co-finance and financial support through policies. Public financial support through domestic policies is estimated at USD 20.5 billion (ZAR 187.8 billion): USD 18.1 billion (ZAR 165.0 billion) from the REIPPPP, USD 0.5 billion (ZAR 4.3 billion) from the electricity levy, USD 0.2 billion (ZAR 1.4 billion) from the tax exemption on CERs, and USD 1.8 billion (ZAR 17.0 billion) from the accelerated depreciation allowance for renewable energy assets, as described in Annex 7. Financial support resulting from international policy (i.e. the CDM) is estimated at USD 0.5 billion (ZAR 5.1 billion). Public co-finance, as estimated in the first analytical approach in Chapter 3, is USD 4.2 billion (ZAR 38.8 billion) with around two thirds from domestic actors (USD 2.8 billion/ZAR 25.4 billion). These various elements are presented in Figure 14.

[16] Depreciation is the process of depleting the cost of an asset as an expense over its expected useful life, which can be used to offset taxable revenue (OECD, 2010).

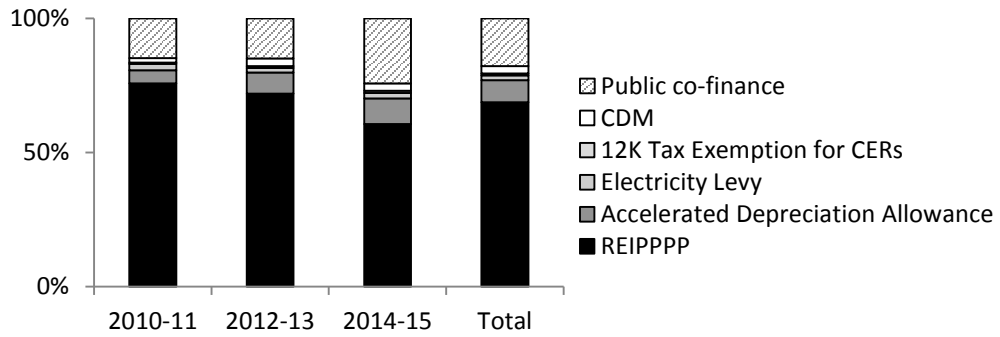
Figure 14. Overview of finance for renewable energy projects in the *investor perspective* scope (2010-2015, USD billions)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), IPP Office (2016), UNEP DTU (2017a, 2017b) and public announcements.

Applying a volume-based pro-rated attribution by instrument type suggests that USD 9.0 billion (ZAR 84.8 billion), or 79%, of the USD 11.3 billion (ZAR 106.9 billion) private finance was mobilised by domestic climate policies, including 69% by the REIPPPP alone. Approximately USD 0.3 billion (ZAR 3.1 billion), or 1%, was mobilised by international policy (Figure 15). Insights from the qualitative consultation support this finding with around 90% of respondents citing REIPPPP as the main enabling factor, while other policies play a more minor role. Estimated mobilisation by public co-finance reduces from USD 8.5 billion (ZAR 77.9 billion), when using the full causality assumption between public and private co-finance of the first analytical approach in Chapter 3, to USD 2.0 billion (ZAR 19.1 billion) under the *investor perspective*.

Figure 15. Share of mobilised private finance for renewable energy attributed to public interventions according to volume-based pro-rated attribution (2010-2015, percentages)

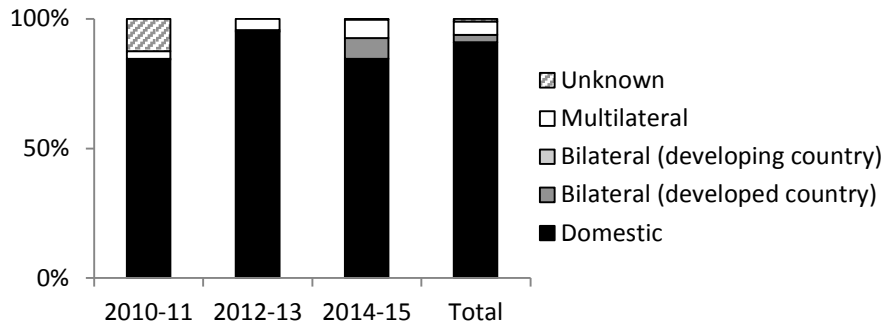


Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), IPP Office (2016), UNEP DTU (2017a, 2017b) and public announcements.

It is counterintuitive that the share of mobilised private finance attributed to the REIPPPP decreased in 2014-15 while the share attributed to public co-finance increased. Methodologically, this reflects that the value of guaranteed PPAs awarded in 2014-15 were lower than in previous years, in-line with falling auction prices despite an increase in capacity procured.[17] Falling auction prices are a result of competition and hint towards a declining need for public co-finance to act as a mobilisation tool. Insights from the qualitative consultation point to the fact that public actors, in particular domestic, may have "crowded out" private investors to some extent over most recent years.

A volume based pro-rating suggests that domestic public actors mobilised USD 10.3 billion (ZAR 96.8 billion), or 91%, of private finance (Figure 16). Their role is further pronounced here compared to Chapter 3 since in addition to providing the majority of public co-finance, domestic public actors contribute almost all financial support through policies.

Figure 16. Share of mobilised private finance for renewable energy attributed to public actors according to volume-based pro-rated attribution (2010-2015, percentages)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), IPP Office (2016), UNEP DTU (2017a; 2017b) and public announcements.

In terms of methodological limitations, the approach taken could overestimate mobilisation by domestic public actors for at least two reasons:

- First, the full value of the auction-based guaranteed PPA is considered rather than the *incremental* value of support provided to renewable energy compared to a conventional technology baseline (as would be the case for some FIT policies). Since similar PPAs did not exist for conventional fuels during the time period considered (2010-2015), a well-defined baseline did not exist. However, from 2014, the REIPPPP has been extended to offer PPAs for conventional coal, gas and cogeneration which could be considered as a baseline in future. Annex 7, nevertheless, includes the results of a sensitivity analysis where only the incremental value of the PPA over the average electricity wholesale price is considered. This reduces the valuation of financial support provided through the REIPPPP from USD 18.1 billion (ZAR 165.0 billion) to USD 11.5 billion (ZAR 101.0 billion). However, the proportion of private finance attributed to policies reduces by only five percentage points, from 79% to 74%.

- Second, this approach does not yet attempt to attribute a mobilisation role to actors who provide upstream capacity building. As illustrated in Section 4.1.3, and strongly supported by insights

[17] By way of example, average auction prices for solar PV decreased by 75% from ZAR 3.43/kWh in 2011 to ZAR 0.85/kWh in 2015 while capacity procured increased from 627 MW in 2011 to 813 MW in 2015 (DoE, NT and DBSA, 2016).

from the consultation, many international (and domestic) organisations were instrumental in supporting development of the REIPPPP and, arguably, should be attributed a portion of this mobilised private finance. Moreover, early demonstration projects and feasibility studies (e.g. the Darling wind farm – see Section 4.1.3), which are likely to have paved the way for future private investment, were largely funded by the international community.

Overview of policies for future analysis

The policy instruments described below are eligible for future inclusion in the *investor perspective*. They are excluded for the time being due to data unavailability, including due to confidentiality concerns.

Since municipalities only have a mandate to distribute and sell electricity, but not to generate or transmit it, they have explored innovative options to seize opportunities associated with renewable energy technologies. By end 2016, 18 of 184 municipalities had implemented or were developing **support schemes for small-scale embedded generation (SSEG)**, which involve a charge for grid use and differentiated tariffs for the sale and purchase of electricity to and from the grid (SALGA, 2016; SEA, 2014). However, the framework for SSEG is constrained by (as yet un-finalised) regulations by the National Energy Regulator of South Africa (NERSA) including the conditions governing the purchase of excess electricity from small-scale embedded generators by municipalities or Eskom (see NERSA, 2015). The South African Local Government Association (SALGA), supported by GIZ, has engaged the DoE and NERSA to finalise this regulatory framework (see draft at DoE, 2016) although this is only expected after an agreement is reached on the Licensing Regulations by the DoE (Creamer, 2015).

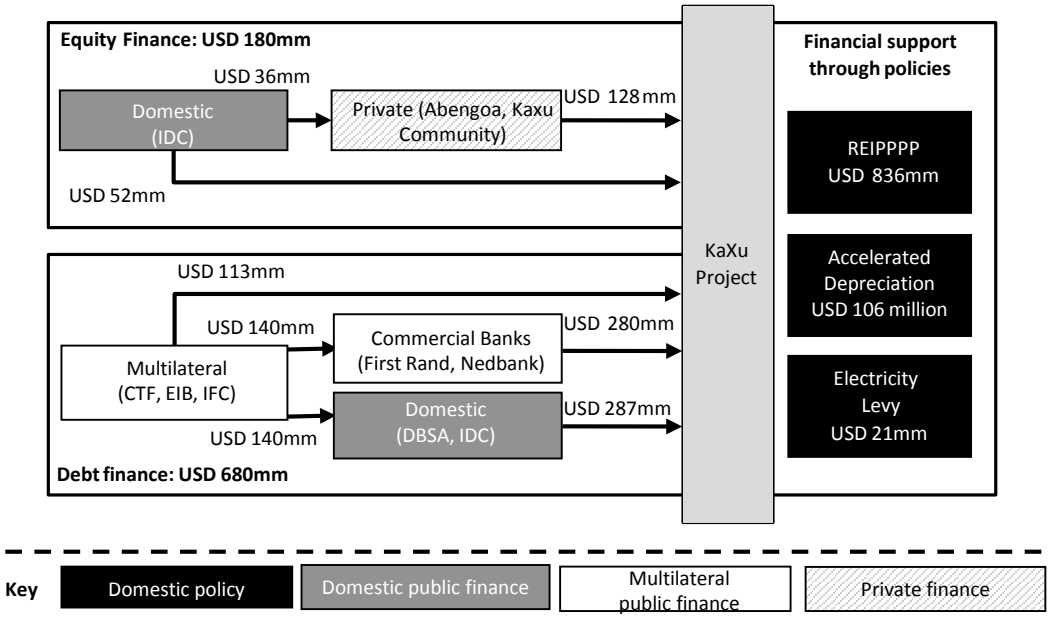
Further, the consolidation of local initiatives into a national **Solar Water Heating (SWH) programme** in 2008 resulted in accelerated deployment of the technology (SEA, 2013). Over 400 000 heaters had been installed by 2016 (Rycroft, 2016) although this fell short of the DoE's target for 1 million installations by end 2015. The programme functions by offering rebates on upfront installation cost of between ZAR 1 900 (USD 204) and ZAR 4 900 (USD 524), targeting residential households and small commercial buildings (IEA and IRENA, 2016). The programme has experienced some hurdles including reduced funding between 2014 and 2015 and the transfer of responsibility from Eskom to the DoE (Steyn, 2015).

Box 1. Project-level case study of the KaXu Concentrating Solar Power installation

KaXu is a 100MW concentrating solar power (CSP) installation in South Africa's Northern Cape which was awarded a PPA during the first bid round of the REIPPPP in 2011. The project achieved financial close in 2014 and the plant became operational in 2015. It is explored as a case study to illustrate that mobilised private finance attributed to specific actors and interventions can vary depending on the scope of public interventions considered.

As shown in Box 1 Figure 1, project-level finance for KaXu consisted of USD 180mm equity finance and USD 680mm debt finance from a combination of public and private actors. Approximately USD 316mm of this project-level finance was provided by upstream public actors. The installation also benefitted from financial support through three public policies – the REIPPPP, accelerated depreciation allowance and electricity levy – with a discounted present value of USD 1.0 billion (see methodology in Annex 7). KaXu did not benefit from CERs under the CDM and consequently was also ineligible for the Section 12K tax exemption for amounts received or accrued from the disposal of CERs.

Box 1 Figure 1. Overview of finance for the KaXu CSP installation (USD millions) (including one level upstream, and financial support through policies)



Source: Analysis by authors based on public announcements (DBSA, 2012; EIB 2015b; IDC, 2015; IFC, 2012; IPP Office, 2016).

Box 1 Figure 2 displays the results of a volume-based pro-rated attribution of mobilised private finance based on differing scopes of public interventions. As shown in the top left chart, domestic actors are attributed around three quarters of the USD 408 million mobilised private finance when only the role of project-level co-finance is considered. This conclusion would also be robust to a risk-based attribution since domestic actors contributed all public equity finance which is typically lowest in the capital structure.

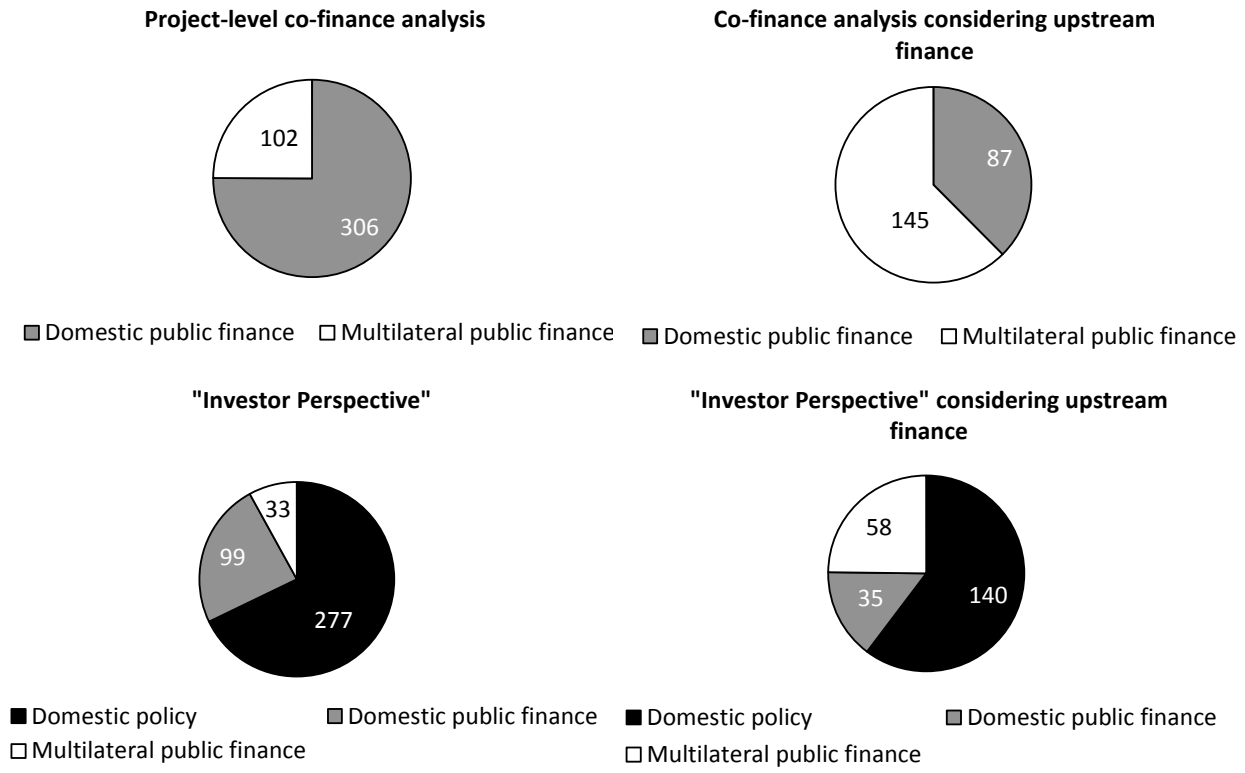
However, as shown in the top right chart of Box 1 Figure 2, the main mobilisation role is attributed to multilateral public finance when both project-level co-finance and upstream finance are considered, due to the upstream debt provided by such actors. The total volume of mobilised private finance is correspondingly lower at USD 232 million. The bottom two charts also incorporate the role of financial support through policies. Domestic public actors are attributed the key mobilisation role in both of these cases since financial support through domestic policies significantly outweighs project-level finance.

Box 1 continued over page.

Box 1. Project-level case study of the KaXu Concentrating Solar Power installation

(continued)

Box 1 Figure 2. Mobilised private finance for KaXu attributed according to volume-based pro-rated attribution across different scopes of public interventions (USD millions)



Source: Analysis by authors based on public announcements (DBSA, 2012; EIB 2015b; IDC, 2015; IFC, 2012; IPP Office, 2016).

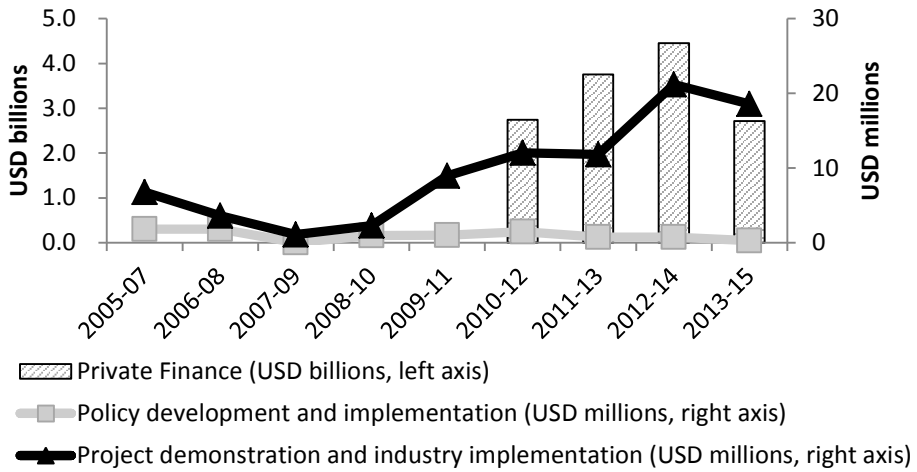
However, these results presented do not consider the possible effect of upstream capacity building interventions which are often provided by bilateral and multilateral actors. The role of such interventions is explored qualitatively for the renewable energy sector in Section 4.1.3.

4.1.3 Assessment of the effect of capacity building activities on private finance

At this stage, a quantification and attribution of volumes of mobilised private finance to specific capacity building interventions or support providers is not possible due to data and methodological limitations. As a result, this section builds a picture of the possible effect of capacity building activities on private finance in a qualitative manner by drawing on available literature, insights from a qualitative consultation (see Annex 7) and observed relationships between private finance and international finance for capacity building activities (over a short period of time). The latter is proxied using volumes of

renewable energy-related[18] ODA from the OECD DAC CRS targeting two themes, namely policy development/implementation and project demonstration/industry implementation (see Figure 17). It is, however, important to note that ODA does not include capacity building support provided by domestic public actors.

Figure 17. Three-year rolling average of private finance and public finance for capacity building activities in the renewable energy sector (Capacity building 2005-2015, Private finance 2010-2015)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), OECD CRS Database (OECD, 2016b) and public announcements.

Capacity building for policy development and implementation

As discussed in Section 4.1.3, results from the *investor perspective* analysis and insights from the qualitative consultation suggest that the REIPPPP has played by far the largest mobilisation role in the renewable energy sector. Although only 36% of respondents identified capacity building support for policy development and implementation as a major enabling factor, the REIPPPP has undoubtedly been shaped by numerous upstream capacity building activities supported by bilateral, multilateral and domestic actors (consistent with case studies by Brown et al. (2015), Stadelmann and Falconer (2015), and Green and Westphal (forthcoming)). Moreover, as shown in Figure 17, volumes of ODA targeting policy development and implementation peaked just before introduction of the REIPPPP. This suggests that significant capacity building efforts may have been focused on the development of the REIPPPP, and hints towards a time lag between public support for policy development and the mobilisation of private finance.

Examples of capacity building activities that influenced the REIPPPP include the Renewable Energy Market Transformation (REMT) project, which ran from 2007 to 2013 with funding from the Global Environment Facility (GEF) and the World Bank. The REMT supported modelling exercises that influenced South Africa's renewable energy targets which were published in the IRP2010 and helped to develop a strong business case for renewable energy deployment (World Bank, 2014). In 2011, the IPP Office was established by the DoE and NT to govern the REIPPPP process with capacity building support from DBSA. Through the South African-German Energy (SAGEN) programme, GIZ also provided

[18] Renewable energy-specific sector codes of the OECD DAC CRS: 23030 Power generation/renewable sources; 23065 Hydro-electric power plants; 23066 Geothermal energy, 23067 Solar energy; 23068 Wind power; 23069 Ocean power; 23070 Biomass.

technical support to the IPP Office for the development of monitoring and reporting tools to track progress of REIPPPP projects (GIZ and DoE, 2014).

Further, regulatory practices in the electricity and renewable energy sectors were evaluated as part of the Regulatory Entities Capacity Building Project conducted in 2013 by the Economic Development Department and the University of Johannesburg with analytical input from TIPS and NERSA (TIPS, 2013). Findings served as the basis for a series of educational programmes by the University of Johannesburg for regulators in South Africa and the Southern African region (CCRED, 2014).

Capacity building for industry implementation and project demonstration

Overall, 60% of respondents to the consultation cited capacity building for industry implementation/project demonstration as a major enabling factor. Further, as shown in Figure 17, there appears to be a positive relationship between private finance and public finance for such capacity building activities. One possible explanation for this, compared to capacity building for policy development and implementation, is that project demonstrations and support to industry enable private investment in the same time period, although such observation is in itself not enough to make causality assumptions. Drawing on examples highlighted through the consultation, the remainder of this section illustrates some of the more noteworthy capacity building activities that appear to have enabled private investment.

Commissioned in 2008, the Darling wind farm (5.2 MW) was the first demonstration project to explore the feasibility of wind-based technologies and test the climate policy and regulatory infrastructure in South Africa. The project benefitted from technical support from the Danish International Development Agency (DANIDA) and funding from the GEF through the South African Wind Energy Programme I (SAWEP I) culminating in the design and negotiation of a bespoke 25-year PPA between Darling and the City of Cape Town. After the failure of initial South African IPP programmes, this intended to set a precedent for future projects (although, as outlined in Section 4.1.2, the more standardised REFIT introduced shortly thereafter did not succeed) (DoE, 2015; LTE Energy Pty Ltd, 2011).

Several capacity building programmes have since targeted improvements and standardisation opportunities for renewable energy feasibility studies (which took over 15 years in the case of Darling). By way of example, between 2008 and 2011, a project funded by DANIDA and the United Nations Development Programme (UNDP) developed a wind atlas database to assist project developers in identifying suitable wind farm locations (DoE, 2015; Royal Danish Embassy, 2010). A similar initiative for mapping solar data is currently in progress by a number of institutions from the Southern African Development Community (SADC) member states with support from GIZ and the United States Agency for International Development (USAID) through the Southern African Universities Radiometric Network (DoE, 2015; SAURAN, 2017).

Eskom did not initiate commercial solar PV demonstrations until 2011 (Lethabo 575 kW and Kendal 620 kW) although falling technology costs have supported their rapid deployment (see IRENA, 2015). In contrast, Eskom started feasibility studies for concentrated solar power (CSP) as early as 1998 with support from the GEF and US National Renewable Energy Laboratory (Boyd, Rosenberg and Hobbs, 2014). Increasing private sector awareness of this technology has been a key aim of the Southern African Solar Thermal & Demonstration Initiative (SOLTRAIN), supported by the Austrian Development Agency and OPEC Fund for International Development (OFID), since 2012 (SOLTRAIN, 2016).

However, encouraging future private investment in renewable energy technologies requires the identification of cost-effective technical solutions for their smooth integration into the grid (De Jongh, Ghoorah and Makina, 2014). As part of SAGEN, which was launched in 2011, GIZ provides ongoing support to Eskom on this issue, as well as running training programmes at universities and institutions to

strengthen technical expertise in the sector (such as through the South Africa Renewable Energy Technology Centre (SARETEC)) (GIZ and DoE, 2014).

4.1.4 Combined conclusions

The REIPPPP played a pivotal mobilisation role for the sector, mobilising USD 7.8 billion (ZAR 73.0 billion) of the USD 11.3 billion (ZAR 106.9 billion) private finance considered in the *investor perspective*. It follows that domestic public actors, who also provide the majority of public co-finance, mobilise an estimated USD 10.6 billion (ZAR 99.9 billion). Most private finance is mobilised for large-scale commercial installations by a combination of public co-finance and financial support through policies, although increasing competition suggests a diminishing need for public co-finance as a mobilisation tool.

The methodology upon which these conclusions are based is imperfect for several reasons. First, the mobilisation effect of the REIPPPP may be overestimated since the full discounted present value of the 20-year auction-based guaranteed PPA is considered, rather than the incremental support for renewable energy over conventional energy projects. Nevertheless, a sensitivity analysis where only the difference between the PPA and the electricity wholesale price is considered yields only a limited reduction in the amounts and share of private finance attributed as having been mobilised by the REIPPPP.

Second, the role of upstream capacity building activities, often by international actors, is not estimated. By drawing on available literature, insights from a qualitative consultation and trends in international finance for capacity building activities (Figure 17), it was possible to build a picture of the likely mobilisation effect of capacity building activities. Such activities by both international and domestic actors have, in particular, helped to shape the current policy landscape, including the REIPPPP which mobilises large volumes of private investment itself. Nevertheless, attributing mobilisation to capacity building activities remains methodologically challenging.

Insights from the consultation also highlight South Africa's favourable financial and investment policy over the period considered as a major enabling factor. Specifically, ease of accessing finance through South Africa's mature banking system is cited. Moreover, clear policy targets, such as those laid out in the IRP2010 create a consistent framework within which renewable energy projects have an important role.

4.2 Energy Efficiency

South Africa is historically one of the most energy- and carbon-intensive economies in the world (DME, 2008). As a result, improving energy efficiency has emerged as a key priority for the South African government, with the aim to increase energy security, competitiveness and sustainability. A 2012 estimate by Eskom identified an energy demand savings potential in South Africa of 12 933 MW (IDC, 2013). This significant opportunity was confirmed by the detailed GHG mitigation potential analysis conducted by the DEA in 2014 (DEA, 2014).

The country's energy efficiency policy framework has been developed over the last two decades, driven by the DoE and the South African National Energy Development Institute (SANEDI). The 1998 White Paper on Energy promoted energy efficiency and energy conservation within the framework of integrated resource planning (DME, 1998). This was reflected in the IRP2010, which targets the equivalent of 3 420 MW of generation capacity through demand-side management (DSM) initiatives by 2030 (DoE, 2011). The drive accelerated with the publication of the National Energy Efficiency Strategy (NEES) in March 2005 (DME, 2005a), subsequently revised in 2008 and 2012 (DME, 2008; DoE, 2012a). The NEES emphasised the urgent need to set national targets (economy-wide and by sector) to improve energy efficiency by 12% by 2015, compared to a 2000 baseline. This commitment was reiterated by all

social partners (government, business, labour and civil society) in 2011 with the signature of the Green Economy Accord (EDD, 2011).

Key domestic programmes are now consolidated under the Energy Efficiency and Energy Demand Management Flagship programme, building on existing efforts particularly by the dti and Eskom (DEA, 2015b). The dti plays a driving role in the implementation of energy efficiency policy, especially standards and labelling, through the South African Bureau of Standards (SABS) and the National Regulator for Compulsory Specifications (NRCS), and through the NCPC, established in 2002, and support schemes. The national utility Eskom has also been an important vehicle through which energy efficiency support has been channelled over the years. Correspondingly, two main complementary channels, namely tax incentives and labels and standards have been used by the South African government to incentivise investments in energy efficiency improvements (by public entities, businesses, and households). These, along with energy efficiency-related capacity building activities, are plotted as a timeline of public interventions presented in Table 4 which form the basis for analysis in Section 4.2.

Table 4. Timeline of public interventions targeting private investment for energy efficiency in South Africa (2005-2015)

Category	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capacity building for policy development and Implementation	DANIDA's CaBREERE support programme (from 2001)								Danish Clay Brick Programme			
							GIZ's SAGEN (2011-2014; 2015-2017)					
					SDC support programme on labelling							
							GEF support programme					
Capacity building for industry implementation and project demonstration	NCPC's RECP programme						NCPC's RECP and IEE programme					
										PSEE (from December 2013)		
Domestic labels and standards	Voluntary labelling and performance standards for electrical and electronic equipment										Mandatory labelling and performance standards	
					Voluntary building standards			Mandatory building standards (from November 2011)				
					Levy on Electric Filament Lamps							
Domestic fiscal policies				Eskom's extensive DSM programmes							Eskom's reduced DSM programmes	
						Tax incentive (12i)				Tax incentives (12i + 12L since Dec 2013)		

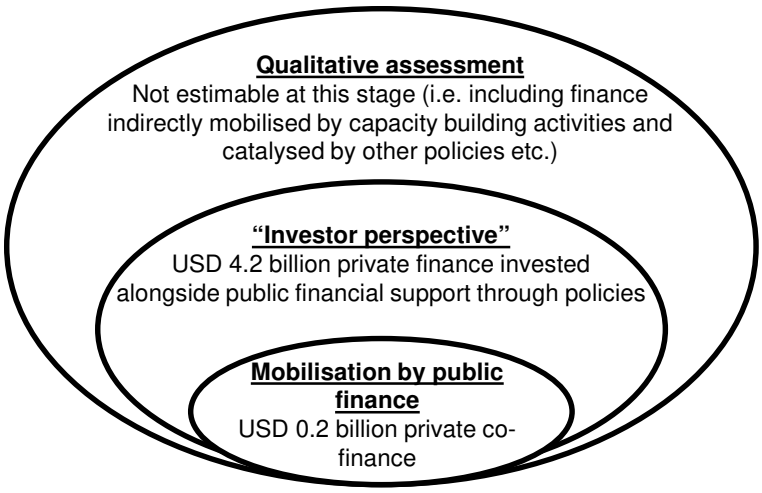
	No effect on private investment estimated
	Mobilisation effect estimated using the *investor perspective* approach
	For inclusion in future estimation using the *investor perspective* pending data availability
	Analysed qualitatively at aggregate sector-level

Source: Authors.

4.2.1 Partial estimate of total private finance

Based on available data, a total of USD 4.2 billion (ZAR 39.2 billion) private finance was estimated as committed to energy efficiency projects over the 2010-2015 period in South Africa. As shown in Figure 18, this includes USD 0.2 billion (ZAR 1.5 billion) private co-finance from the first analytical approach in Chapter 3, and a further USD 4.0 billion private finance that benefited from financial support through policies. Since privately-funded projects (i.e. with no public co-finance) are substantial, this confirms the key role of the private sector in rolling out energy efficient practices and technologies and reflects the existing business case for numerous energy efficiency investments. The USD 4.2 billion (ZAR 39.2 billion) forms the scope for analysis using the *investor perspective* methodology.

Figure 18. Estimate and overview of total private finance for energy efficiency (2010-2015)



Note: At this stage, it is not possible to provide a realistic estimate of private investments made in the absence of policies and/or co-finance (e.g. which may have been indirectly mobilised by capacity building support). It was possible to identify a further USD 0.6 billion which would fall into this category, although this does not include small-scale investments for which data could not be sourced (e.g. for individual household investments).

Source: Analysis by authors based on data from a consultation with national financiers and policy-makers/implementers, bilateral and multilateral development finance institutions (2016, 2017), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015) and public announcements.

4.2.2 Estimation of the effect on private finance of public policies that can be translated into financial support: the **investor perspective**

Overview of policies considered in the analysis

Policies are included in the analysis if they have a possible mobilising effect on private finance for energy efficiency, and can be translated into financial support at the project-level. Two South African policies, namely the 12i and 12L tax incentives, match these criteria. The nature of energy efficiency investments, which are generally part of larger projects or small incremental improvements, leads to support policies (i.e. tax incentives) being the main vehicle through which the state intervenes in the sector.

The 12i tax incentive, managed by the dti offers indirect financial support for energy efficiency greenfield investment and plant expansion in commercial enterprises. The scheme targets investment projects in relevant manufacturing sectors, such as agro-processing, chemicals, plastics, non-metallic and mineral products, metal products, construction and recycling industries. In order to access the scheme,

brownfield projects must *inter alia* realise a 10% energy efficiency improvement, while greenfield projects must utilise "modern, viable energy-efficient equipment & processes" (the dti, 2015).

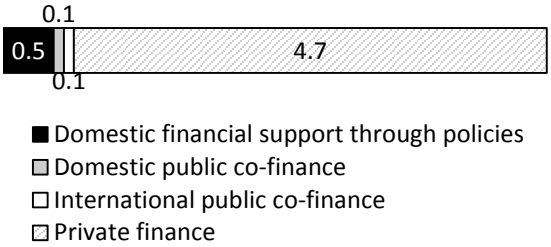
The 12L tax incentive for energy savings has been implemented by the DoE since December 2013, allowing businesses to claim a deduction against taxable income equivalent to the monetary value of proven energy efficiency savings. The scheme was further enhanced in March 2015 with an increase in the deduction from ZAR 0.45 to 0.95 (USD 0.04 to 0.07) for every kWh saved (SANEDI, 2016).

In terms of international policies, 17 energy efficiency projects in South Africa have earned CERs through the CDM (see Section 3.2.2 for an overview of the mechanism). However, the mobilisation effect of the CDM could not be accurately estimated for energy efficiency due to limited availability of granular project-level financial data (UNEP DTU, 2017a; 2017b).

Results of the investor perspective *analytical approach*

The 12i and 12L tax incentives have had an estimated total financial support value of USD 0.4 billion (ZAR 4.0 billion) and USD 0.1 billion (ZAR 0.8 billion) between 2010 and 2015 (see Annex 7 for data and methodological details). As shown in Figure 19, this is more than double the volume of energy efficiency-related public co-finance identified in Chapter 3.

Figure 19. Overview of finance for energy efficiency projects in the *investor perspective* scope (2010-2015, USD billions)



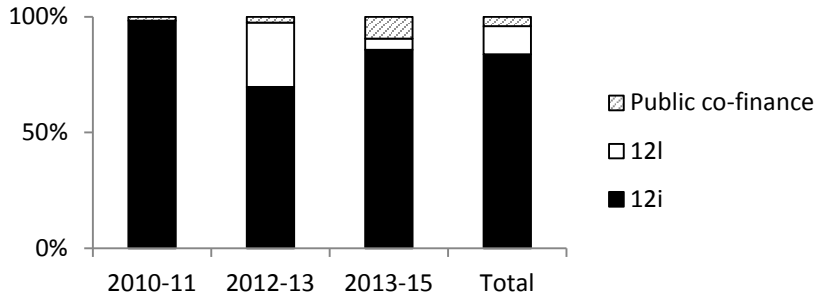
Source: Analysis by authors based on data from a consultation with national financiers and policy-makers/implementers, bilateral and multilateral development finance institutions (2016, 2017), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015) and public announcements.

A volume-based pro-rated attribution indicates that the 12i incentive plays the most important role in mobilising private investment (Figure 20). A total of USD 3.5 billion (ZAR 31.6 billion) private finance for energy efficiency was attributed to the 12i incentive over the period 2010-2015. This represents 84% of all private finance in the *investor perspective* scope. This result is due to the large volume of total financial support provided by this scheme, which in turn can be explained by the relatively large size of the greenfield and expansion projects supported. Insights from the consultation confirm the driving role played by the 12i incentive, with 80% of respondents identifying the scheme as an enabling factor.

By comparison, USD 0.5 billion (ZAR 4.8 billion) was attributed to the 12L incentive, or 12%, of the total private finance considered. The scheme focuses on energy efficient improvements in existing facilities, which are more incremental and less capital intensive than the types of projects supported by 12i. The decline in the estimated mobilisation in most recent years from an initial high base (see Figure 20 below) is biased due to one significant investment supported in 2013. That single project accounts for 84% of the total private finance attributed to the scheme over the period 2013-2015. Further, the increase in the incentive rate in March 2015, coupled with an improved management of the scheme, has generated a substantial growth in the uptake of the scheme in 2016.

Last but not least, public co-finance is estimated to have mobilised USD 0.2 billion (ZAR 2.3 billion), or less than 5% of total private finance committed alongside public co-finance and/or public financial support through policies. Despite assuming that private finance is mobilised by the *combination* of public co-finance and financial support through policies, this volume is comparable to the mobilisation effect inferred in the first analytical approach of Chapter 3, since public co-finance is typically committed to projects that are distinct from those covered by 12i and 12L. Moreover, the two tax schemes are also considered as not overlapping as they target different types of projects as described above.

Figure 20. Share of mobilised private finance for energy efficiency attributed to public interventions according to volume-based pro-rated attribution (2010-2015, percentages)



Source: Analysis by authors based on data from a consultation with national financiers and policy-makers/implementers, bilateral and multilateral development finance institutions (2016, 2017), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015) and public announcements.

A volume-based pro-rated attribution by public actor type shows that domestic actors mobilise the vast majority of private finance for energy efficiency (approximately 97%). This follows from Figure 20 since the 12i and 12L tax incentives are both managed by the dti on behalf of the South African government.

Overview of policies for future analysis

In addition to the two tax incentives discussed above, the following policy areas have been excluded from the analysis due to data unavailability, but could be incorporated in future with modifications to the methodology beyond the project cash flow approach that underpins the *investor perspective*. These were, however, qualitatively covered through the consultation where respondents identified these as the two policy areas with the largest enabling effect on private investment (larger than the tax incentives above).

Eskom has run a number of energy efficiency demand side management (EEDSM) programmes since the late 1990s, providing financial and technical support to electricity consumers. The Efficient Lighting Initiative (ELI), a three-year USD 10 million (ZAR 79.5 million) programme co-funded by the IFC, GEF and Eskom that ran from 1999 to 2003, is one example of an early programme that aimed to accelerate the diffusion of energy-efficient lighting technologies in South Africa (Bredenkamp, 2002).

From 2008 to 2013, Eskom significantly extended its support programmes for DSM initiatives (see Eskom, 2013 for full details). However, most programmes have now been put on hold (partially in 2013, then fully in 2014) due to NERSA disallowing most of Eskom's DSM requested budget (NERSA, 2013). In 2015, Eskom nevertheless re-started two programmes to rollout light emitting diode (LED) and compact fluorescent lamp (CFL) equipment, as well as to support energy efficiency projects through energy service/savings companies (ESCos) for industrial, commercial and residential customers. Further, in order to incentivise energy efficient lighting and in line with the country's goal to phase out incandescent

lighting, an environmental levy on electric filament lamps, payable by manufacturers, was introduced in 2009. It has been progressively increased to ZAR 6 per bulb in April 2016 (SARS, 2016).

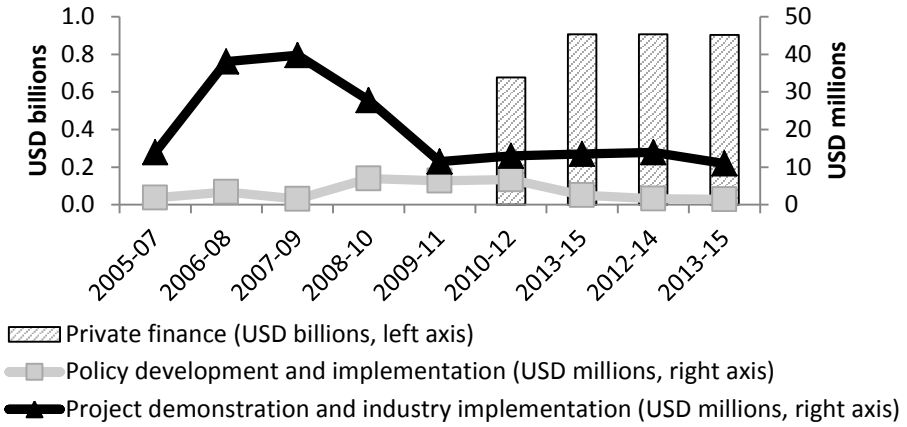
Jointly with support programmes, regulations and information measures have been used extensively to improve energy efficiency performance in South Africa. A voluntary labelling scheme for electrical and electric appliances (such as refrigerators, washing machines, dryers, dishwashers, electric water heaters, ovens, air conditioning and heat pumps) was introduced in 2005 as a precursor to a mandatory standards and labelling programme. Following the development of a voluntary energy performance standard (SANS 941) by the SABS in 2012 and the publication of the 'Compulsory Specification for Energy Efficiency and Labelling of Electrical and Electronic Apparatus' on 28 November 2014 (the dti, 2014), the first mandatory labelling standards for appliances came into force in 2015.

In parallel, the construction sector was used as a primary avenue to improve performance. The energy efficiency in building standard (SANS 204), that was drawn up in 2009 as a voluntary scheme, was made binding in November 2011, targeting new buildings. Municipalities have the responsibility to approve plans for new buildings and are required to enforce the SANS 204 standards.

4.2.3 Assessment of the effect of capacity building activities on private finance

This section considers the effect of key international and South African capacity building activities for energy efficiency, which have been instrumental in the development of energy efficiency policy and awareness raising in the industry. However, similar to Section 4.1.3, a quantification and attribution of volumes of mobilised private finance to capacity building interventions and providers is not possible due to data and methodological limitations. Figure 21 plots private finance alongside public finance for capacity building activities[19] targeting two themes, namely policy development and implementation, and project demonstration and industry implementation. Coupled with insights from the qualitative consultation and available literature, observed relationships between these two data series contributes towards building a picture of the likely effect of capacity building activities.

Figure 21. Three-year rolling average of private finance and public finance for capacity building activities in the energy efficiency sector (Capacity building 2005-2015, Private finance 2010-2015)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), OECD CRS Database (OECD, 2016b) and public announcements.

[19] Proxied using ODA data from the OECD DAC CRS plus finance for NCPC-SA's RECP and Industry Energy Efficiency (IEE) programmes (USD 1.2 million/ZAR 13.5 million; fees paid to resource management consultants by NCPC-SA) and the PSEE initiative (USD 12.8 million/ZAR 150 million; representing the total budget).

Capacity building for policy development and implementation

Capacity building activities were cited as an enabling factor for private energy efficiency investment by around half of respondents to the consultation, with capacity building for policy development more commonly cited as a *major* enabling factor compared to capacity building for industry. As shown in Figure 21, there has been a progressive decline in support for policy development and implementation over the period 2010-15 following a peak around 2009-11 which is coherent with the maturation of the energy efficiency policy framework in the country. This hints towards a possible time lag between public support for policy development, the implementation of energy efficiency policy and subsequent mobilisation of private finance for energy efficiency projects.

The South African government, primarily the DoE, has benefited from a number of international programmes to develop policies, strategies and standards related to energy efficiency. In particular, substantial assistance was received from European countries for the development of the NEES. Denmark, through the DKK 27 million (USD 3.9 million) Capacity Building Project in Energy Efficiency and Renewable Energy (CaBEERE) programme (2001-2005), supported the development of energy efficiency policies through baseline assessments, study tours, strategy plans, training, standard development and capacity assessment.

As part of a broad renewable energy and efficiency programme of DKK 40 million (USD 6.9 million) over the 2013-2016 period, Denmark further assisted the development of policy and regulation. The recent programme included multiple elements: (i) support and capacity building for policy development on energy efficiency in existing buildings, (ii) the development of a regulatory framework for smart meters, (iii) the implementation of smart meter technology in public buildings, (iv) the analysis of energy demand initiatives in public buildings based on smart metering, and (v) the rollout of a National Energy Efficiency Awareness Campaign Strategy (DME, 2005b; Embassy of Denmark in South Africa, n.d.; Mabusela and Momsen Fredslund, 2015).

The South African government has also received noteworthy implementation support since the publication of the NEES, such as for development of the labelling programme. For example, the GEF through UNDP provided a USD 6 million (ZAR 56 million) grant over the period 2009-2015 as part of the Market Transformation through Energy Efficiency Standards and Labelling initiative. The programme, which now benefits from a further USD 13.5 million (ZAR 126 million) public funding (from the South African government, the national utility and other donors), notably included training on how to test appliances for energy efficiency (GEF, 2017).

Another example of support for implementation is the ZAR 120 million (USD 13.9 million) assistance provided by the Swiss Agency for Development and Cooperation (SDC) over the period 2010-2014 for an Energy Efficiency Monitoring Project (Pennington, 2010). The project assisted with the monitoring of energy efficiency targets in the building sector. This was also supported by GIZ's SAGEN programme with the training of 200 energy auditors in the building sector as well as study tours to Germany on energy performance certificates, cogeneration and municipal energy efficiency programmes (GIZ, 2015).

Capacity building for industry implementation and project demonstration

Over 60% of respondents to the consultation for energy efficiency cited capacity building for industry implementation/project demonstration as a major or minor enabling factor that could lead to private investment. Further, as shown in Figure 21, there appears to be a possible positive relationship between private finance and public finance for such capacity building activities. This hints towards a role for such capacity building activities in stimulating private investment. Industry has been a primary target of capacity building and project demonstration initiatives by both the South African government as well as

international donors, through programmes to stimulate efficiency awareness as well as the rollout of energy efficiency at the firm level, as described through examples below.

The South African government, through the NCPC-SA, runs two energy efficiency-specific training programmes. The Resource Efficiency and Cleaner Production (RECP) programme offers subsidised training and resource utilisation assessments (considering energy, water, materials and waste) to industry. Since 2010, together with the United Nations Industrial Development Organisation (UNIDO) and a number of other partners (UK DFID, the Swiss Secretariat for Economic Affairs, the dti and the DoE), the NCPC-SA also implements the so-called Industrial Energy Efficiency (IEE) Improvement Project. It provides training on energy management for end users as well as firm-level support for the implementation of energy management systems and energy systems optimisation (NCPC-SA, 2017a).

Another key implementation and demonstration activity has been the PSEE programme, which ran from December 2013 to November 2015 by the National Business Initiative with GBP 8.6 million (USD 12.8 million) support from DFID. The programme assisted more than 3 500 small-sized businesses with remote advice via help-desk services, workshops and publications. It also provided more than 900 medium-sized businesses with fully-funded four-day energy surveys and follow-up services, including longer-term support in developing energy saving strategies. It further supported 37 large companies with investment support (up to 60% subsidised energy-reduction consultancies that take place over an eight-month period) and fully-funded specialised energy audits (NBI, 2016).

These efforts are actively complemented by numerous municipalities through their energy offices. The City of Cape Town's Energy Efficiency Forum, established in 2009 in collaboration with Eskom and the South African Property Owners Association (SAPOA), is one such initiative. The Forum was created to promote energy efficiency in commercial buildings and operations, and includes owners of commercial buildings and providers of energy efficiency-related services. It is co-funded by Old Mutual, the Friedrich Naumann Foundation, the Western Cape Government and the Energy Research Centre at University of Cape Town, and receives support from various organisations, such as SANEDI, GreenCape, the Cape Town Chamber of Commerce and the National Business Initiative (City of Cape Town, 2015).

Industry-specific initiatives are also being supported. SDC has, for instance, been supporting the brick industry since 2009, with the aim of reducing energy use across the approximately 100 industrial clay brick manufacturing plants in South Africa.[20] The programme has included the development of an Energy Efficiency Guideline to be used as a reference tool for operators in the industry as well as the rollout of the most energy efficient clay brick firing technology at a pilot plant in 2014 (Swisscontact, 2016a; 2016b).

4.2.4 Combined conclusions

The analysis of energy efficiency investments over the period 2010-2015 highlights the existence of multiple, distinct channels of public-private interaction. Unlike the renewable energy sector, public interventions in the energy efficiency sector tend not to interact with each other. Indeed, although data gaps did not allow for a full assessment of the possible combinations between all the channels, different streams of public interventions appear to be targeting and supporting different types of energy efficiency projects and underpinning investments.

Tax incentives plays the most prominent role in the sector, mobilising the bulk of private finance in support of commercial greenfield projects and plant expansion (12i scheme) as well as energy efficiency

[20] The first phase, the Vertical Shaft Brick Kiln (VSBK) project, ran from 2009 to 2013. The second phase, the Energy Efficiency Clay Brick (EECB) project started in November 2013 and is expected to be concluded by October 2017.

improvements in existing facilities (12L scheme). The role of tax incentives, which reduce initial investment burden, is particularly consistent with the nature of energy efficiency interventions, which have short payback periods but require an upfront capital investment. The domination of tax incentives would likely be further strengthened with the inclusion of Eskom's DSM programmes in the analysis, which were identified as a major enabling factor through the qualitative consultation.

By contrast, public co-finance in the energy efficiency space is rather limited. This can be partly explained by the incremental and small-scale nature of efficiency improvements (the so-called 'low-hanging fruits') performed at the firm or household level. The South African Government's grant programme (MCEP) could, however, play a much stronger role, compared with the only 1.5% of the programme support directed to the 'green technology and resource efficiency improvement' investments over the period 2012-2015.

The role of capacity building programmes, particularly the NCPC-SA's schemes and the PSEE, in raising awareness on energy efficiency and assisting firms and households in identifying energy efficiency opportunities, should be stressed. Self-assessment from the NCPC-SA and the PSEE programmes highlights that the two initiatives have respectively resulted in energy efficient investments of USD 2.2 million (ZAR 19.1 million) (NCPC-SA, 2017b) and USD 5.9 million (ZAR 69 million) (NBI, 2016).

4.3 Adaptation in the Water Sector

South Africa is water-stressed, and shortages are increasingly common across the country. Adapting to the water-related effects of climate change is important economy-wide since many economic sectors are dependent on water, such as agriculture and the domestic sector which consume 62% and 27% of the country's water respectively (DWAF, 2008). Adaptation efforts can take place across the water value chain at the point of harnessing resources, during treatment and distribution, as well as at the level of consumption (PEGASYS, 2012).

Due to the dispersed and varied nature of water-related investments across economic sectors and the value chain, it was not possible to provide a realistic estimate of publicly-mobilised private finance for climate adaptation (see overview of data availability in Annex 3). However, the likely effect of adaptation-related water policies and capacity building activities is analysed qualitatively in this section, by drawing on insights from the qualitative consultation and available literature, after first introducing overarching framework policies relevant to the sector (not necessarily climate-specific).

Key water policies in South Africa include the Water Services Act of 1997 (RSA, 1997) and the National Water Act of 1998 (RSA, 1998). As outlined in these policies, water infrastructure is typically provided by the DWS with involvement by government-owned special purpose vehicles (SPVs), such as the Trans-Caledon Tunnel Authority (TCTA), for large-scale bulk infrastructure (AFRICEGE, 2016; Amis 2016; Ruiters 2013; TCTA 2016). Water boards, Catchment Management Areas (CMAs), Water User Associations, and municipalities also provide water infrastructure. Significant private finance is regularly raised for bulk infrastructure projects to address South Africa's pre-existing water stressed environmental factors and the historical legacy of under-provision of water resources. Financing is further raised through water user tariffs and government grants (see AFRICEGE, 2016; Creamer Media 2012; Ruiters 2013; TCTA 2015, 2016). Infrastructure projects such as these, however, generally fall outside the time scope and definition of climate activities (Annex 1) of the present analysis.

Co-operation between the public and private sector has been emphasised in overarching policy frameworks such as the Water for Growth and Development Framework (DWAF, 2009), the National Water Resource Strategy (DWA, 2013b), and the Water Research, Development, and Innovation (RDI)

Roadmap: 2015-2025 (WRC, DST and DWS, 2015). Further, between 1992 and 2006, 11 Public Private Partnership (PPP) water projects were implemented, mainly at the municipal level (World Bank, 2016b), and governed by the Municipal Finance Management Act of 2003 (NT, 2004).[21] However, due to cumulative barriers, such as lack of capacity, and an ineffective partnership development framework, the majority were deemed unsuccessful and no new projects were initiated within the current analytical timeframe. While these projects were not in climate adaptation specifically, public-private collaboration has been more successful in the financial aspects of the water sector as a whole than in the institutional collaboration (Africege, 2016; Amis, 2016).

Adaptation-related policies in the water sector

As the dominant provider of water infrastructure and services, the state has undertaken a number of water efficiency and adaptation initiatives to respond to the effects of climate change without private sector involvement. These initiatives form part of the Department of Water and Sanitation's strategic objectives (DWS 2015). Some are mainstreamed through the Water Conservation and Water Demand Management Strategy (DWAF 2004b), the Policy on Financial Assistance to Resource Poor Irrigation Farmers (DWAF 2004a), and the Water for Growth & Development Framework (DWAF 2009). Recent policies have made efforts to mainstream climate change responses into the water sector across the value chain including the Climate Change Status Quo Analysis and Strategy for Water Resources in South Africa in 2012 (see DWA, 2013a) and the Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) (Climate Change Implications for the Water Sector) in 2013 (see DEA and SANBI, 2013a). Furthermore, the Climate Change Response Strategy for the Water Sector asserts key strategic actions to enhance climate change adaptation in the water sector (DWS, 2016). However, policy incentives to mobilise private finance for adaptation in the water sector are lacking, especially at the household and industry level. This finding was also shared by the majority of respondents in the qualitative consultation.

Adaptation-related capacity building activities in the water sector

Several capacity building initiatives in the water sector have focused on encouraging public-private sector co-operation. While not all of these initiatives have targeted mobilisation of private investment specifically, such efforts have the potential to indirectly mobilise private finance in later years. The available climate-related ODA data for the water sector[22] shows that DAC members provided about USD 2 million (ZAR 19 million) for policy development and implementation, and USD 19 million (ZAR 178 million) for project demonstration and industry implementation from 2005 to 2015. This is notably lower than the volumes of support provided for energy-related mitigation activities (see Sections 4.1.1 and 4.2.1). Nevertheless, 73% of respondents to the consultation identified capacity building activities as an enabling factor for private investment with relevant examples highlighted below.

In terms of capacity building for policy development, GIZ has played a role through the Climate Support Programme which has supported DEA with scientific analysis and consensus building since 2009. The initiative influenced the development of the LTAS and National Adaptation Strategy which outline opportunities for mainstreaming adaptation across the water value chain (GIZ, 2015). However, as noted in

[21] For national and provincial government departments, the main legislation governing PPPs is Treasury Regulation 16 issued in the Public Finance Management Act, 1999 (PFMA), while for municipal government it is the Municipal Systems Act, 2000, and the Municipal Finance Management Act, 2003 (NT, 2004).

[22] Water-related sector codes of the OECD DAC CRS: 14010 Water sector policy and administrative management; 14020 Water supply and sanitation - large systems; 14030 Basic drinking water supply and basic sanitation; 14031 Basic drinking water supply; 14032 Basic sanitation; 14040 River basins' development; 14050 Waste management / disposal.

the context of adaptation-related policies, there is a need to further mainstream adaptation responses and incentivise private sector investment through policy measures.

In terms of capacity building for industry, the Strategic Water Partners Network South Africa (SWPN-SA) seeks to address water risks and challenges by bringing together various stakeholders including industry, government, business organisations, civil society organisations, and development agencies (Madden, 2015; NEPAD Business Foundation, 2013; WRG, 2012). Another illustration is the Danish-South African collaboration in the water sector programme, which has targeted the demonstration of and collaboration for water technology development and skills enhancement since 2013 (WWF-SA, 2015). Since 2006, GIZ has also managed the Development Partnerships with the Private Sector (DPPs) Programme[23], which jointly develops projects with businesses, the state, and civil society actors. Three projects were developed in the water sector over the 2009-2014 period for a total investment of EUR 2.3 million, including EUR 1.2 million from the private sector (GIZ, 2014a; 2014b).

Acknowledging the limited incentives targeting wider private sector investment especially at the industry level, the NCPC-SA is in the process of implementing an Industrial Water Efficiency (IWE) project, following the model of the Industry Energy Efficiency (IEE) project (discussed in Section 4.2.3) (James, 2016). The IWE project aims to achieve sustainable transformation of industrial water usage practices in the country through reducing water consumption, improving industrial water effluent quality, easing pressure on fresh water supplies, and demonstrating economic and environmental benefits of water efficiency practices (NCPC-SA, 2017c). Such a programme has the potential to mobilise private climate finance as corporations start to implement water efficient techniques along their value chains. Systematic data collection by NCPC-SA on investments resulting from the IWE project would make it possible to quantify its effect on private investment. For instance, the NCPC-SA estimated that in 2016, through water focused assessments, South African industry has saved 63 600 kL water, with a financial value of ZAR760 000 (NCPC-SA, 2017c).

Alternative approaches for encouraging private adaptation-related investment in the water sector

The South African government has explored private sector engagement through corporate social responsibility initiatives, although the in-kind nature of such interventions makes it challenging to develop a picture of private finance mobilisation. The government-led Business-Adopt-a-Municipality (BAAM) programme encourages private sector organisations to help vulnerable municipalities address institutional and service delivery challenges. A notable example is the collaboration between Santam (a private financial services company) and five municipalities, through which Santam provides support for fire-fighting, flood and storm water management (Santam, 2016). In addition, the private sector has also provided in-kind support to government-led ecological infrastructure programmes. For example, the uMngeni Ecological Infrastructure Partnership (UEIP) in KwaZulu-Natal (comprising 36 public and private actors) aims to improve South Africa's water resources (among other environmental goods and services) through the conservation, protection, restoration, rehabilitation and maintenance of key ecological infrastructure (PICC, 2014).

[23] While these appear similar to PPPs, they are in fact softer versions. Official PPPs are led by the government and guided by specific legislation as described in Footnote 22.

5. CONCLUSIONS AND RECOMMENDATIONS

This study estimated and analysed publicly-mobilised private finance for climate action in South Africa between 2010 and 2015. Results suggest that domestic public actors played the largest private finance mobilisation role by providing financial support through targeted policies, and to a lesser extent by committing project-level co-finance. This assessment is partly qualified when considering the role of public finance committed through upstream financial intermediaries (funds and credit lines) and capacity building activities, both being mostly provided by international public actors. Further methodological work is required to quantify the mobilisation effect of such interventions as well as of other public policies. To this end, renewed efforts and collaboration should be directed towards institutionalising the collection of data on private co-financing and investments made in relation to financial support provided through policies.

5.1 Factors mobilising and hindering private finance for climate action in South Africa

Domestic public actors play a larger role than international providers in mobilising private climate finance by committing project-level co-finance. This conclusion is robust to attribution methodologies based on either volume (which favours debt providers) or risk (which favours equity providers), since domestic public actors provide the largest volumes of both debt and equity co-finance. Bilateral and multilateral agencies, however, play a larger role than domestic actors in mobilising private finance through upstream financial intermediaries, such as credit lines and funds.

The estimated mobilisation effect of financial support through targeted domestic policies outweighs the mobilisation effect of project-level public co-finance in both the renewable energy and energy efficiency sectors. Results, however, highlight differences between these two sectors, while the water sector does not currently lend itself to such analysis. Further, results are context specific and cannot be transferred or generalised as other developing countries do not necessarily have equivalent domestic policies providing financial support for climate projects.

- In the renewable energy sector, public policy and finance interventions have been combined to mobilise private investment. The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) has, however, played by far the largest role. This conclusion holds true across a range of methodological assumptions for valuing recurring financial support provided through the REIPPPP. The policy has amassed considerable interest from the private sector through holding tenders for large-scale renewable energy installations, thereby reducing the need for public co-finance to play a risk-reducing role. Mobilisation by financial support resulting from international climate policies, namely the Clean Development Mechanism (CDM), is comparatively small. While quantifying the effect of capacity building activities on private investment remains challenging, these have undoubtedly played a key role by supporting the two-decade long development of South Africa's policy framework for renewable energy. Looking ahead, the current stand-by status of the REIPPPP, which is faced with strong opposition from the national utility, is likely to negatively impact investment. Such developments emphasise the importance of ensuring policy certainty. Similarly, noteworthy efforts to mobilise smaller-scale private investment, such as through Eskom's Solar Water Heating programme and municipality support schemes for small-scale embedded generation (SSEG), have been muted by national dynamics that should be addressed in the near future.

- In the energy efficiency sector, similar to renewable energy, targeted policies providing financial support (in the form of tax breaks) have played the main role in mobilising private investment. However, public interventions tend to mobilise private finance for different types of projects (greenfield versus improvements to existing installations), thereby displaying a high degree of complementarity. Nevertheless, the opportunity to offer support for smaller-scale industrial energy efficiency projects and improvements could be explored, for example by upscaling the National Cleaner Production Centre's capacity building programmes. Grant schemes, such as the Manufacturing Competitiveness Enhancement Programme, could also play a more significant role, as only a marginal part of their funding is currently directed towards sustainable investments. In addition, public interventions targeting mobilisation of household-level investments in energy efficiency are lacking and constitute a relevant area for municipalities to engage, especially following the downscaling of Eskom's national-level programmes.

- In the water sector, significant financing is regularly raised for bulk water infrastructure. However, current policies do not provide clear incentives for climate change adaptation-related private investment. Looking ahead, household- and enterprise- level investments in solutions to adapt to the water-related effects of climate change could be unlocked by providing financial incentives for private investment in water conservation and demand management.

South African public interventions aimed at mobilising private investments in the climate space are largely concentrated at the national level. The action of both provincial and municipal institutions is limited to publicly-funded service delivery as well as investment facilitation, such as partnership building and regulatory support. Opportunities for sub-national institutions to play a more active role in mobilising private investment for climate mitigation and adaptation should be further explored, building on the efforts of the pioneering local and provincial governments that are, for instance, financially supporting the rollout of embedded generation through creative models. Further, the experience of the City of Johannesburg, which released the first green bond in South Africa in 2014 for ZAR 1.5 billion (USD 139 million) to finance sustainability-related activities, illustrates another possible avenue for municipalities to tap into private finance (City of Johannesburg, 2014).

As renewable energy-related projects become increasingly commercially viable, including as a result of support policies and decreasing technology costs, public interventions could progressively be re-directed to incentivise private investment in other climate-relevant sectors. In terms of public finance, this is particularly relevant for financial institutions that have a developmental mandate. Further, government interventions to encourage private investment for energy efficiency could also be broadened to encompass resource efficiency as a whole. In the cases of the water sector and SSEG, adequate regulatory frameworks and incentive schemes could trigger meaningful private finance. Similarly, South Africa has identified an investment need for electric and hybrid vehicles in its INDC, an area which, however, still lacks policy incentives. A broader alignment of climate-relevant efforts with other policies (primarily the country's energy, mineral beneficiation and industrial policies) should also be pursued by the South African government.

5.2 Methodological developments to measure and report publicly-mobilised private finance

Estimating publicly-mobilised private finance remains a field of on-going work. Country- and sector-level analyses were, therefore, constrained by the lowest common denominator in terms of information availability across projects. As a result, relatively simple methodological choices were made. In particular, mobilised private finance was attributed among public actors according to the volume of finance committed ("volume-based attribution"). Applying a more complex risk-based attribution would have required further information on the role and characteristics of each public intervention (such as the lead arrangers in loan syndicates, and project-level capital structures). At this stage, only the

methodologies developed by the OECD Development Assistance Committee (DAC) for official development finance instruments, and data collected on that basis, make it possible to address time- and risk-related aspects.

Applying alternative causality and attribution assumptions for individual projects and instruments (credit lines and investments in funds) provides more granular evidence to complement aggregate-level findings. A case study of the 100MW KaXu concentrated solar power (CSP) installation showed that results of attributed mobilised private finance can vary significantly based on the scope of public interventions considered (i.e. project-level finance, upstream finance, policy interventions). An analysis of credit lines and investments in funds underlined that international actors mobilise private finance upstream from end projects. An instrument-specific attribution (adapted from methods developed by the OECD DAC) was used for this. Future methodological developments at the international level should strike a balance between accurately representing and reattributing the role played by various instruments, while taking into account data and information availability constraints.

An expanded methodological approach (the *investor perspective*) was piloted to account for the mobilisation effect of public climate interventions beyond public co-finance. At this stage, it proved practically feasible to estimate the effect of domestic public policies that can be translated into financial support at the project-level. Examples include the REIPPPP and the Department of Trade and Industry's tax incentives for greenfield and brownfield energy efficiency upgrades. This methodology represents a step forward towards building numerical evidence on the transformational role of policies. Future work could, however, further develop and conceptualise this approach, as well as test it in different sector, country and policy contexts. In doing so, particular attention should be paid to the sensitivity of results to assumptions on valuing financial support provided by policies, including over time.

Beyond the *investor perspective*, practical options for incorporating the role of upstream capacity building activities, often by international actors, could also be explored. Moreover, possibilities for combining the results from this methodology with insights from more qualitative (e.g. survey-based) approaches could be considered. Pending these developments, government officials could consider whether and how to use such an approach as input to official streams of domestic and international climate finance reporting.

The mobilisation role of South African public finance and policy interventions could be highlighted in relevant reporting channels. Methodologies underpinning international data collection (by the OECD DAC in particular) ensure that private finance is attributed across all public finance providers involved in a project (bilateral, multilateral and domestic alike) in order to avoid overestimating the role of any individual actor and to minimise double counting. However, institutions and countries such as South Africa that, at least for the time being, do not report to the DAC will not feature in final results and statistics. South Africa's efforts to establish a climate finance tracking mechanism (as part of a Climate Change Response Monitoring and Evaluation System) could play a key role in filling this reporting gap.

5.3 Data availability and gaps in the South African context

The use and collation of a range of primary and secondary data sources enabled the core of the intended analysis. However, multiple data gaps and inconsistencies were observed. In general, data-related limitations were more significant earlier in the 2010 to 2015 time scope and for sectors other than renewable energy.

South African governmental authorities could consider conducting capacity building and awareness raising on the importance of progressively improving climate finance data collection and availability. In addition to the small number of relevant national-level public climate finance providers

that provide a representative picture of large-scale investment in the country (notably national development banks and state-owned enterprises), this should, perhaps more importantly, target relevant regional and municipal actors. The engagements carried out within the framework of this research and the data collection template designed for the occasion could represent a useful starting point for the South African government to institutionalise (i.e. on an annual basis) and broaden data collection. The design of a common template and methodology, as part of the Climate Change Response Monitoring and Evaluation System being currently developed by the Department of Environmental Affairs (DEA), would also help significantly in that regard.

Providers of public climate finance should renew efforts and collaboration towards institutionalising the collection of data on private finance invested alongside their own commitments. This would reduce the need for time-consuming ad-hoc data collection for future studies. Current public and private co-finance data availability remains partial and inconsistent in format and level of granularity across international providers of public climate finance. This is partly due to an absence of standard reporting formats (private co-finance data is typically extracted manually from individual project documentation) as well as confidentiality restrictions. Future studies would benefit from developments in on-going data collection efforts by individual donor countries (e.g. Abeille et al., 2015), at international and collective levels (OECD, 2015; Benn et al., forthcoming; 2016) and by international development finance institutions (Multilateral Development Banks, 2016; 2015a; 2015b; Stumhofer et al., 2015).

Commercial investment databases are a useful source of complementary data but lack the break-down needed for detailed analyses on publicly-mobilised private finance. On the one hand, consulting commercial databases enabled the identification of a number of relevant projects without any public co-finance involved. On the other hand, commercial databases typically do not contain the information needed to distinguish contributions by individual public and private finance providers. Coverage also varies greatly across countries; investments in upper-middle-income economies, such as South Africa, are likely to be more comprehensive than in lower-income countries. Moreover, commercial databases rarely enabled the identification of public-private co-financed projects distinct from those that had already been highlighted by public finance providers. This is because commercial databases typically focus on large transactions.

Records of private investments made in relation to targeted climate policy proved to be key data sources to expand the coverage of the analysis. This was particularly the case for energy efficiency, where most private investments identified in relation to the two existing tax incentives had not been identified through co-financing and commercial data. Relevant ministries and agencies should strengthen efforts to collect comprehensive and granular data on private investments resulting from policies that provide financial support to climate-related projects. This would greatly improve the ability to both estimate and report volumes of publicly-mobilised private finance, and assess the respective effectiveness and efficiency of the combination of public finance and policy interventions having led to such mobilisation.

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ANNEXES

This section contains annexes accompanying the report. The aim in providing such a level of technical detail is to provide further transparency on data, definitions and methodologies used, as well as to contribute to the body of work produced under the Research Collaborative on Tracking Private Climate Finance. This is in-line with the objective of facilitating follow-up work to replicate, expand and deepen the quantification and analyses of publicly-mobilised private finance for climate action.

ANNEX 1. INDICATIVE LIST OF CLIMATE-RELEVANT SECTORS AND ACTIVITIES

The indicative list of climate-relevant sectors and activities displayed in Table A1.1 is based on the guidance and examples provided by both the OECD Development Assistance Committee Rio markers and a group of multilateral development banks for identifying and reporting climate change mitigation and adaptation activities. This indicative list was used as a reference point when requesting co-finance information from public finance providers, as well as for assessing the climate-relevance of projects identified in commercial databases.

Table A1.1 Indicative list of climate-relevant sectors and activities

Climate-relevant sectors	Examples of climate change mitigation and adaptation activities (not exhaustive list)
Renewable energy	Electricity generation (wind, geothermal, solar, biomass or biogas, ocean, hydropower plants) Solar water heating Transmission systems or new systems (ICT, storage facility) linked to the development of renewable energy sources
Supply-side energy efficiency	Retrofit and improvement of energy transmission and distribution systems to reduce energy use and/or technical losses Retrofit and energy efficiency improvement in existing power plants
Demand-side energy efficiency	Energy audits Retrofit and energy efficiency improvement (building, lighting, heating/cooling, waste heat recovery, new design, new technology) in commercial and residential sectors, public services, agriculture or industries Construction of new buildings or facilities using the latest resource efficiency standards
Non-energy industrial greenhouse gas reductions	Improvements in industrial process and cleaner production processes relating to air conditioning and cooling systems, as well as fugitive emissions Carbon capture and storage
Transport and storage	Vehicle (road, rail, maritime, air) energy efficiency fleet retrofit Urban transport modal change (urban mass transit and non-motorised transport) Urban development planning (spatial planning, transport demand management measures) leading to a reduction in the use of passenger cars Inter-urban transport and freight transport (rail, waterways) Protection (e.g. elevation) of transport infrastructure from climate-related damage
Water	Improved catchment management and regulation of water abstraction Treatment of wastewater over and above compliance requirement Protection of water infrastructure (elevation of well heads, relocation of well fields away from floodplains) from climate-related damage (flooding, storm water overload and sea-level rise)
Waste	Reduction of methane emissions from solid waste (incineration of waste, landfill gas capture and landfill gas combustion) Waste recovery, recycling and reuse

Resilient infrastructure	Protection of transport or water infrastructure (see "Transport" and "Water" above) Design of climate-resilient equipment and systems (more stable cranes for harbours in cyclone zones, improved refrigeration in food processing and/or distribution that address more extreme heat) Establishment of business alternative (new trade routes in case of disruption of main route due to climate-related disasters; increased search for resources and offshore drilling outside hurricane seasons or zones; Diversification of tourist attractions to encompass inland or low climate-risk areas) Protection barriers against floods, storms and other climate-related impacts (physical/natural reinforcement of coastline and/or additional coastal structures/vegetation; improved design and construction of tailings in the mining industry; increased river dredging programmes, reinforcement of levees, reestablishment of natural flood plains and vegetation in upstream areas/river banks; improved solid waste management and collection, increased capacity and other changes in drainage systems) Use and improved enforcement of revised regulations, codes and standards and risk assessments for infrastructure and building design that consider climate-related risks (increased frequency/severity of extreme events) Reduction of climate-related supply risks, such as optimisation of hydro-infrastructure design based on climate and hydrological models)
Agriculture, forestry and fishing	Sustainable forest management, afforestation and reforestation (including protection and improvement of carbon pools) Biosphere conservation projects (including payments for ecosystem services) Reduction of methane or other GHG emissions (livestock farming) Production of sustainable biofuels (biodiesel, bioethanol) Research and development investments on resilient crops Reduction of crop failure risks (supplemental irrigation, multi-copping systems, drip irrigation, levelling) Improved forest fire management and pest/disease outbreak management Increased production of fodder crops to supplement rangeland foraging for livestock production Adoption of sustainable aquaculture techniques Establishment of core protected areas and buffer zones for sustainable use of biodiversity and water
Banking and financial services	Carbon markets and finance (purchase, sale, trading, financing, guarantee and other technical assistance) Green credit lines to domestic finance institutions Provision of climate-related insurance Provision of finance to SMEs providing climate-relevant services, e.g. engineering of adaptation solutions or insurance
Information and communications technologies (ICTs)	Identification of ICT sites (key national data centres and infrastructure) at greatest climate risk (storms, floods) and enhancement of resilience of those sites and/or services Investments in weather and climate services that can reach the end users efficiently
Cross-cutting activities	Policy and regulation linked to climate change mitigation and adaptation Institutional reforms and strengthening to include climate aspects in policies and regulations in flexible manner Green supply chain management (across sectors) Low-carbon technologies, R&D, innovation (across sectors) GHG accounting activities (across sectors) Education programmes and technical capacity building on climate change-related issues Integration of climate change scenarios into disaster risk plans and preparedness Monitoring of changes in disease outbreaks and development of a national response plan
Other	Any other activity not covered by previous categories

Source: Adapted from the 2014 Joint Report on Multilateral Development Banks' Climate Finance (Multilateral Development Banks, 2015a) and the OECD Development Assistance Committee's Guidance table for climate change Rio markers (OECD, 2016b).

ANNEX 2. OVERVIEW OF DECISION POINTS AND METHODOLOGICAL OPTIONS USED

Following the four-stage framework developed under the Research Collaborative for estimating mobilised private climate finance (Jachnik, Caruso and Srivistava, 2015), this annex details the methodological options exercised to analyse and estimate private finance mobilised by public finance (Table A2.1), and private finance mobilised by financial support through policies (the *investor perspective*) (Table A2.2).

Table A2.1 Overview of decision points for analysing private finance mobilised by public finance provided at the project-level and intermediated through credit lines or funds

Stages	Short description of methodological options pursued
1. Define core concepts	*Climate change activities:* Projects are included if they intend to have a climate mitigation or adaptation objective. See Annex 1 for an indicative list of relevant activities.
	Public and private finance: In-line with the OECD DAC definition, transactions are considered public if they are undertaken by central, state or local government agencies at their own risk and responsibility, regardless of whether these agencies have raised the funds through taxation or through borrowing from the private sector. This includes transactions by public corporations i.e. corporations over which the government secures control by owning more than half of the voting equity securities or otherwise controlling more than half of the equity holders' voting power. All other entities are considered private.
	Country classification: All international public finance (regardless of the country or institution providing it) with South Africa as destination country as well as domestic public finance within South Africa is included. For the purpose of the analysis, international public finance is then split between multilateral (unassigned to individual countries), bilateral developed (UNFCCC Annex II countries) and bilateral developing (UNFCCC non-Annex I list)
	Geographical origin of private finance: Due to data and methodological limitations, it was not possible to assign a country of origin to private finance.
2. Identify public interventions and instruments	*Type of public intervention:* Public finance provided at the project-level and intermediated through credit lines or funds that is provided alongside private finance is considered (i.e. public "co-finance").
	Specific instruments: All instruments used by public actors to provide finance at the project-level (grants, loans, equity, mezzanine financing, guarantees and insurance) as well as intermediary instruments such as funds, funds-of-funds and credit lines. Export credits (loans and guarantees) are excluded due to data confidentiality and methodological issues that are yet to be addressed.
3. Value public interventions and account for total private finance involved	*Currency and conversion:* Volumes of finance are reported both in USD and ZAR. Conversions are applied using annual OECD official exchange rates.[24]
	Point of measurement: Volumes of finance are measured at the date of commitment. All commitments made between 1st January 2010 and 31st December 2015 are included.
	Value of public interventions: All public finance instruments are accounted for at their face value.
	Boundaries: Public finance provided at the project-level: all private co-finance is considered. Projects benefitting from either only public finance or only private finance are out of scope. Public investments in funds and funds-of-funds: only private finance in the first funding round is considered. Note that, due to data limitations, the approach taken here differs from that of the DAC, which considers all private investment made within five years of a public investment. Public credit lines: private finance at two possible levels is considered: (i) top-up funds by the recipient local financing institution and (ii) project-level equity invested by the end-borrower.
	Data availability: Varies for each project based on the degree to which institutions are able to provide granular information about the volumes and types of private finance committed alongside their public finance and the extent to which the data could be complemented by OECD DAC data, commercial databases and/or online sources. See Annex 3 for a detailed summary of primary data availability and gaps. See Annex 4 for a

[24] https://data.oecd.org/conversion/exchange-rates.htm.

	summary of commercial database coverage.
4. Estimate private finance mobilisation	*Causality:* Public finance provided at the project-level: it is assumed that public co-finance mobilises all private co-finance. Funds and funds-of-funds: it is assumed that public finance mobilises all private finance in the same funding round. Credit lines: it is assumed that public finance mobilises the local financing institution's top-up funds (if it is a private entity) and equity provided by the end borrower (since end borrowers are typically private entities).
	Attribution: Mobilised private finance is attributed to public finance providers (i.e. domestic, multilateral, bilateral developed, and bilateral developing) and instruments according to the volume of public finance provided It is, therefore, implicitly assumed that every unit of public finance has the same mobilisation effect regardless of the provider or instrument type.

Source: Authors.

Table A2.2 Overview of decision points for analysing private finance mobilised by the combination of public co-finance and financial support provided by public policies (the investor perspective)

Stages	Short description of methodological options pursued
1. Define core concepts	*Climate change activities:* Renewable energy and energy efficiency projects (see Annex 1).
	Public and private finance: See Table A2.1.
	Country classification: See Table A2.1.
	Geographical origin of private finance: See Table A2.1.
2. Identify public interventions and instruments	*Type of public intervention and instruments:* Those described in Table A2.1 plus domestic policy interventions that can be translated into financial support at the project-level.
	Specific instruments: Those described in Table A2.1 plus domestic policy interventions such as tax incentives, subsidies, rebates, power purchase agreements.
3. Value public interventions and account for total private finance involved	*Currency and conversion:* See Table A2.1.
	Point of measurement: See Table A2.1.
	Value of public interventions: See Annex Table 2 for public finance. Public policies are accounted for at face value if they provide a one-time payment (e.g. rebate for upfront cost of installing an efficient heating system). They are accounted for at a discounted present value if they provide a stream of guaranteed future cash-flows (e.g. guaranteed power purchase agreements). Future cash-flows guaranteed from year *i* for a period of *t* years are discounted using the South African Treasury bond yield in year *i* with maturity *t*. See Annex 7 for further details on the discounted present value calculations.
	Boundaries: In addition to private co-finance at the project-level (see Table A2.1), the scope is expanded to also include private finance committed to projects or programmes that receive financial support through domestic policies.
	Data availability: See Table A2.1 for public and private co-finance. The financial value of policies and expanded private finance scope are estimated using data sourced from implementing agencies (e.g. SANEDI for energy efficiency tax incentives) and publicly available sources (e.g. IPP Office project database).
4. Estimate private finance mobilisation	*Causality:* It is assumed that private finance at the project-level is mobilised by the combination of project-level public co-finance and public policies providing financial support. While public interventions that do not provide financial support at the level of individual projects (e.g. capacity building support for policy development) may help to mobilise private finance, this methodology does not allow for their inclusion as the support they provide is too far upstream from the private finance provision.
	Attribution: Mobilised private finance is attributed to types of public finance providers (e.g. multilateral, domestic, developed, developing) and channels (e.g. co-finance, domestic policy) according to the volume of public finance provided. It is, therefore, implicitly assumed that every unit of public finance has the same mobilisation effect regardless of the provider or channel.

Source: Authors.

ANNEX 3. PRIVATE CO-FINANCING DATA AVAILABILITY

Table A3.1 expands upon the availability of co-finance data for the specific purpose of the present project across multilateral, bilateral and domestic actors. The below list does not, however, provide a comprehensive overview of institutions or programmes providing public finance in support of climate projects in South Africa. It is rather the subset of institutions that were identified as having had a possible mobilisation effect on private finance during the period 2010-2015.

Table A3.1 Summary of private co-financing data availability and sources

Organisation Type	Organisation	Estimated Data Coverage	Comment
Multilateral	AfDB	Complete	Full data for AfDB finance, total project value and volume/nature of public and private co-finance.
	EIB	Partial	Full data for EIB finance and total project value. Partial data on actors/instruments/volumes of public and private co-financers.
	IFC	Partial	Full data for IFC finance and total project value. Partial data on actors/instruments/volumes of public and private co-finance.
	GEF	Complete	Full data for volumes/instruments of public and private co-finance. Limited data for private sector actors/types.
Bilateral	BIO (Belgium)	No relevant projects	No relevant projects during the time period covered
	FINEXPO (Belgium)	No relevant projects	No relevant projects during the time period covered
	CDB (China)	No data	No contact could be established
	IFU (Denmark)	Complete	Full data for IFU finance, total project value and volume/nature of public and private co-finance.
	AFD (France)	Partial	Partial data for total project value, AFD finance, actors/instruments/volumes of public and private co-finance.
	Proparco (France)	No data	No contact could be established
	DEG (Germany)	No data	No contact could be established
	KfW (Germany)	Partial	Partial data for total project value, KfW finance, actors/instruments/volumes of public and private co-finance.
	JBIC (Japan)	Complete	Full data for JBIC finance, total project value and volume/nature of public and private co-finance.
	JICA (Japan)	No relevant projects	No relevant projects during the time period covered
	KEXIM (Korea)	No relevant projects	No relevant projects during the time period covered
	KOICA (Korea)	No relevant projects	No relevant projects during the time period covered
	K-SURE (Korea)	No relevant projects	No relevant projects during the time period covered
	FMO (Netherlands)	Limited	Full data for FMO finance. Limited data on total project value and actors/instruments/volumes of public and private co-finance.
	Norfund (Norway)	No data	No contact could be established
	CDC (UK)	No data	No contact could be established
	DECC (UK)	No relevant projects	No relevant projects during the time period covered

	DFID (UK)	Complete	Full data on DFID finance, total project value and volume/nature of public and private co-finance.
	OPIC (USA)	Limited	Data received only for 2013-14. Full data for OPIC finance and total project value. Full data on total volume of public and private co-finance. Limited data on actors/instruments.
	USAID (USA)	Limited	Data received only for 2013-14. No relevant data to report at this time.
National	IDC	Complete	Full data for IDC finance, total project value and volume/nature of public and private co-finance.
	DBSA	Partial	Data received for the Green Fund only.
	Eskom	Pending	Unable to provide data within the analytical timeframe
	Transnet	Complete	Full data for Transnet finance, total project value and volume/nature of public and private co-finance.
	PIC	No data	Declined to provide data.
	Land Bank	No relevant projects	No relevant projects during the time period covered could be identified based on the Land Bank's reporting systems.
	NEF	Complete	Full data for NEF finance, total project value and volume/nature of public and private co-finance.
	SANEDI	Complete	Full data for SANEDI's finance, total project value and volume/nature of public and private co-finance.
	The dti	Partial	Partial data on the grant component of MCEP.
	DST	No data	No data could be provided based on DST's reporting systems.
	DWS	No data	No relevant project
	DAFF	No data	No contact could be established.
	SEFA	Complete	Full data for SEFA's finance, total project value and volume/nature of public and private co-finance.
	SEDA	No data	No contact could be established.
	CEF	No data	Declined to participate.
	SAA	Complete	Full data for the Project Solaris.
	Technology Innovation Agency	Complete	Full data for Technology Innovation Agency finance, total project finance and volume of co-finance.
	NCPC-SA	No relevant projects	No relevant projects during the time period covered.
	WRC	No data	No relevant projects could be identified.
	ARC	No data	No relevant projects could be identified.
	NDMC	No data	No relevant projects during the time period covered.
	TCTA	No data	Could not provide the relevant data
Provincial	Gautrain Management Agency	Complete	Full data for the Gautrain's finance, total project value and volume/nature of public and private co-finance.
	Innovation Hub (Gauteng Province)	No relevant projects	No relevant projects during the time period covered
	Free State Development Corporation (FDC)	No relevant projects	No relevant projects during the time period covered
	Limpopo Economic Development Agency	No data	No contact could be established

	(LEDA)		
	Mpumalanga Economic Growth Agency (MEGA)	No relevant projects	No relevant projects during the time period covered
	Eastern Cape Development Cooperation (ECDC)	No relevant projects	No relevant projects during the time period covered
	Ithala Development Finance Corporation Limited	No relevant projects	No relevant projects during the time period covered
	Gauteng Infrastructure Financing Agency (GIFA)	No relevant projects	No relevant projects during the time period covered
	Green Cape	No relevant projects	No relevant projects during the time period covered
	Northern Cape Economic Development, Trade and Investment Promotion Agency	No relevant projects	No relevant projects during the time period covered
	KZN Growth Fund	No relevant projects	No relevant projects during the time period covered
	North West Development Corporation (NWDC)	No relevant projects	No relevant projects during the time period covered
	City of Johannesburg	No relevant projects	No relevant projects during the time period covered
	Ethekwini Metropolitan Municipality	No relevant projects	No relevant projects during the time period covered
	Tshwane Metropolitan Municipality	No relevant projects	No relevant projects during the time period covered
	City of Cape Town	No relevant projects	No relevant projects during the time period covered
Municipal	Drakenstein Municipality	No relevant projects	No relevant projects during the time period covered
	Mogale City	No relevant projects	No relevant projects during the time period covered
	Eden District Municipality	No relevant projects	No relevant projects during the time period covered
	Nelson Mandela Bay Municipality	No relevant projects	No relevant projects during the time period covered
	Mbombela Metropolitan Municipality	No relevant projects	No relevant projects during the time period covered
Water Boards	Johannesburg Water	No data	No contact could be established
	Rand Water	No data	No contact could be established
Catchment Management Agencies	Limpopo	No data	No relevant projects during the time period covered
	Berg-Olifants	No data	No relevant projects during the time period covered
	Inkomati-Usuthu	No data	No contact could be established
	Breede-Gouritz	No data	No contact could be established
	Olifants	No data	No contact could be established
	Pongola-Mzimkulu	No data	No relevant projects during the time period covered
	Mzimvubu-Tsitsikama	No data	No contact could be established
	Vaal	No data	No relevant projects during the time period covered
	Orange	No data	No relevant projects during the time period covered

Source: Authors based on consultations with national financiers, bilateral and multilateral development finance institutions.

ANNEX 4. COMMERCIAL DATABASE COVERAGE AND AVAILABILITY

Four commercial databases were consulted to supplement primary data collection on public and private investments, namely Bloomberg New Energy Finance, Thomson Reuters (both project finance and syndicated loans modules), Dealogic and IJGlobal. From a starting point of 675 entries across the databases (with overlaps), 252 (37%) were ultimately eligible for use in this analysis (Table A4.1). Overall, commercial databases were used to supplement primary data for approximately 40 projects which involved public co-finance (analysed in Chapter 3). A further 30 projects were identified that were purely privately-financed but benefited from financial support through policies (analysed using the *investor perspective* in Chapter 4).

Table A4.1 Summary of commercial database entries analysed for co-finance analysis

Database	Total number of entries	All project finance entries (i.e. no mergers/acquisitions)	All climate-relevant AND project finance entries	All entries with total value AND climate-relevant AND project finance
Bloomberg New Energy Finance	123	111	110	59
Thomson Reuters (Project Finance)	131	131	82	39
Thomson Reuters (Loans)	214	145	45	45
Dealogic	71	68	47	47
IJGlobal	136	110	76	62
Total	**675**	**565**	**360**	**252**

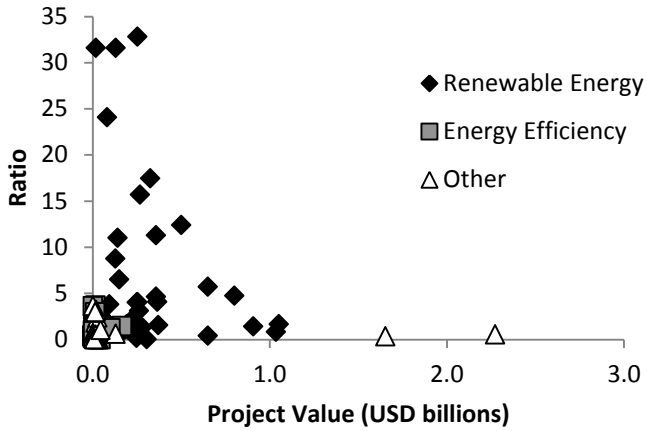
Source: Analysis by authors based on data from BNEF, Dealogic, IJGlobal, Thomson Reuters (2016).

ANNEX 5. DISTRIBUTION OF PRIVATE TO PUBLIC CO-FINANCE RATIOS

Figure A5.1 is a scatter plot of the ratio of individual private-to-public co-finance ratios versus project-level investment volumes for a selection of the 113 projects covered in the analysis. The following can be observed:

- On average, projects with an investment value less than USD 50 million (ZAR 467 million) have a lower private to public co-finance ratio (1.6) than projects with an investment value greater than USD 50 million (5.4);
- For projects with an investment value less than USD 50 million (ZAR 467 million), the private to public co-finance ratios for renewable energy (1.8) and non-renewable energy projects (1.1) are of a similar magnitude;
- For projects that are greater than USD 50 million (ZAR 467 million) in size, the private to public co-finance ratio for renewable energy projects (5.8) is significantly larger than for non-renewable energy projects (0.8);
- There are no non-renewable energy projects with a private to public co-finance ratio of greater than 3.7.

Figure A5.1 Illustration of the variability of private-public co-finance ratios for selected projects (2010-2015)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), public announcements.

ANNEX 6. OVERVIEW OF CLIMATE-RELATED FUNDS IN SOUTH AFRICA

Table A6.1 provides an overview of the individual climate-relevant funds, which were identified as active in South Africa and achieved first financial close between 2010 and 2015. Publicly accessible links have been provided for access to more detailed information. Only those funds with both public and private investors at first financial close are included in the analysis in Section 3.3.1.

Table A6.1 Overview of climate-relevant funds active in South Africa and achieving first financial close between 2010 and 2015

Fund	Sector	Region	First Financial Close Date	Private Investor Participation at first Financial Close*	Link
Lereko Metier Sustainable Capital Fund	Renewable energy	Regional Sub-Saharan Africa	2013	No	www.metier.co.za/index.php/private-equity/lereko-metier-sustainable-capital.html
SolAfrica fund	Renewable energy	South Africa	2012	No	www.metier.co.za/index.php/Private-Equity/solafrica-fund.html
African Infrastructure Investment Fund II	Resilient infrastructure	Regional Africa	2011	Yes	www.aiimafrica.com/funds/funds_aiif2/
Apollo	Renewable energy	South Africa	2012	No	www.aiimafrica.com/funds/funds_apollo/
GEF Africa Growth Fund	Renewable energy/Demand-side energy efficiency	Regional Sub-Saharan Africa	2013	Yes	www.afdb.org/en/topics-and-sectors/initiatives-partnerships/global-environment-facility-gef/
International Housing Solutions II	Demand-side energy efficiency	Regional Africa	2014	Yes	www.ihsinvestments.co.za/
Africa Sustainable Forestry Fund	Agriculture, forestry and fishing	Regional Sub-Saharan Africa	2010	No	www.cdcgroup.com/The-difference-we-make/Case-Studies/Africa-Sustainable-Forestry-Fund/
Vantage GreenX Fund	Renewable energy/Demand-side energy efficiency	South Africa	2013	Yes	www.vantagecapital.co.za/what-we-do/vantage-greenx
Energy Access Ventures	Renewable energy	Regional Africa	2015	Yes	www.eavafrica.com/
KLP Norfund Investment AS	Renewable energy	South Africa	2013	Yes	www.norfund.no/investmentdetails/klp-norfund-investments-as-article10656-1042.html
Moringa SICAR, SCA	Agriculture, forestry and fishing	Regional Sub-Saharan Africa	2013	Yes	www.moringapartnership.com/web.php/16/en/about-us/organisation
African Renewable Energy Fund	Renewable energy	Regional Africa	2014	Yes	www.afdb.org/en/news-and-events/article/african-renewable-energy-fund-aref-launched-with-100m-committed-capital-and-anchor-investments-from-afdb-and-sefa-12901/
Silverlands Fund	Agriculture, forestry and fishing	Regional Africa	2014	Yes	www.silverstreetcapital.com/Groups/106322/SilverStreet_Capital_Home/Agricultural_Investment/Agricultural_Investment.aspx

* based on or inferred from publicly-available information.

Source: Authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC Surveys (2016, 2015) and public announcements (as described in the table).

ANNEX 7. ESTIMATING A PROJECT-LEVEL VALUE OF FINANCIAL SUPPORT FOR POLICIES THAT CAN BE MONETISED

This annex describes the calculation method used to monetise policies that provide financial support at project-level in the renewable energy and energy efficiency sectors (no relevant policies were identified for the water sector). Policies that offer a one-time financial incentive (e.g. a one-time tax rebate) can be valued at face value, similar to public finance instruments (e.g. individual grants, loans and equity). However, for policies that offer multiple or recurring direct financial support or incentives over time (e.g. guaranteed electricity power purchases), the time value of money principle must be considered. According to this principle, cash flows in the present are worth more than cash flows in the future. In general, the discounted present value for a stream of cash flows R_t at time periods $t = 0, \dots, N$ with discount rate i is defined as follows:[25]

$$\text{Discounted present value} = \sum_{t=0}^{N} \frac{R_t}{(1+i)^t} \tag{1}$$

Renewable Energy

All five policies considered in the renewable energy sector provide recurring financial incentives over time, meaning discounted present values must be calculated. The variables R_t, t and i are policy-specific, as described below.

<u>REIPPPP</u>

Expected annual revenue from electricity purchases based on the auction-based guaranteed PPA awarded to projects under the REIPPPP are projected on a nominal basis and denoted by $R_t(p, q, b)$: measured in ZAR

$$R_t(p, q, b) = C_p * F_q * H_t * P_{b,q} \tag{2}$$

Where:

- C_p is the capacity of REIPPPP installation $p = \{1, 2, \dots, 66\}$ in MW
- F_q is the average capacity factor in % for technologies $q = \{PV,\ CSP,\ Onshore\ Wind,\ Biomass,\ Small\ Hydro\}$ sourced from DoE, NT and DBSA (2016)
- H_t is the number of hours in one time interval t (i.e. 8,760 for annual t)
- $P_{b,q}$ is the average auction price in ZAR/MWh for technology $q = \{Solar\ PV,\ Solar\ CSP,\ Onshore\ Wind,\ Biomass,\ Small\ Hydro\}$ during bid window $b = \{1,2,3,3.5,4\}$ sourced from DoE, NT and DBSA (2016, 2015)

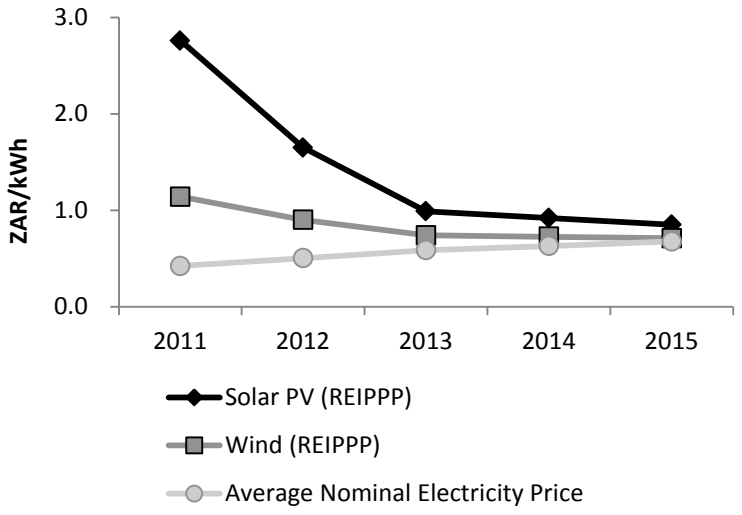
[25] An annual discrete-time discounted present value is preferred here for simplicity, although a continuous model could arguably be used for policy-related financial incentives.

The time periods t are defined as annual intervals up to a maximum of 20, which is equivalent to the length of PPAs awarded under the REIPPPP. The nominal interest rate i is approximated by the 20-year South African Treasury bond yield in the year of financial commitment.[26]

Box A7.1 Analysis of the sensitivity of results for the renewable energy sector to the valuation of the recurring REIPPPP payments

This specification considers the full value of recurring payments under the REIPPPP. However, a possible alternative option would consider the *incremental* discounted present value of recurring payments under the REIPPPP compared to a non-renewable energy baseline. Since 92% of electricity in South Africa is generated from coal (IEA, 2014a), a 20-year coal PPA could be considered an appropriate baseline. However, over the 2010-2015 time period, Eskom operated and owned the vast majority of coal power stations in South Africa, meaning such coal PPAs did not exist. For the purpose of performing a sensitivity analysis, average nominal electricity tariffs charged by Eskom between 2010 and 2015 can be assumed to roughly reflect the price at which a coal PPA would have been extended, had such a programme been in place. Figure A7.1 graphs the average auction prices for solar PV and wind achieved under the REIPPPP between 2011 and 2015, alongside the average electricity tariff charged by Eskom.

Figure A7.1 Evolution of REIPPPP auction prices for solar and wind alongside Eskom's average electricity tariff (2011-2015, ZAR/kWh)



Source: DoE (2013; 2012b), IPP Office (2016) and Eskom (2016).

A sensitivity analysis suggests the conclusion that renewable energy policies play a key mobilisation role is robust whether the full value or incremental value of recurring payments under REIPPPP is valued (Figure A7.2). Despite the volume of financial support provided by the REIPPPP decreasing from USD 18.1 billion (ZAR 165.0 billion) when valued fully, to USD 11.5 billion (ZAR 101.0 billion) under the incremental scenario, the share of mobilisation decreases only from 79% to 74%. From 2014 onwards, the REIPPPP has been extended to non-renewable energy technologies including coal. The first auction round took place in 2014 although financial close for the successful projects had not been reached by end-2015. In future, 20-year PPAs awarded to coal projects under this programme could be used as a baseline.

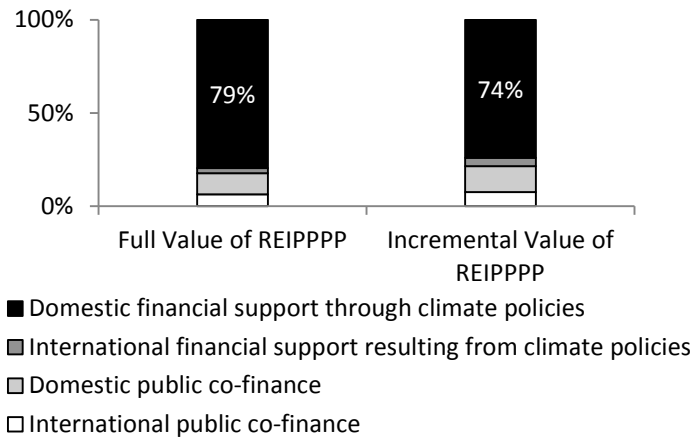
Box A6.1 continued over page.

[26] South Africa Treasury bond data from: www.investing.com/rates-bonds/south-africa-20-year-bond-yield.

Box A7.1 Analysis of the sensitivity of results for the renewable energy sector to the valuation of the recurring REIPPPP payments

(*continued*)

Figure A7.2 Share of mobilised private finance in the renewable energy sector attributed to public interventions according to volume-based pro-rated attribution, across valuations of the REIPPPP (2010-2015, percentages)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), IPP Office (2016), UNEP DTU (2017a; 2017b) and public announcements.

Electricity Levy for Non-Renewable Energy Resources

The annual implicit subsidy offered by the Electricity Levy is projected on a nominal basis and denoted by $R_t(p,q)$ measured in ZAR:

$$R_t(p,q) = C_p * F_q * H_t * L \quad (3)$$

Where:

- C_p, F_q, H_t as per the above
- L denotes the electricity levy in ZAR/MWh (i.e. ZAR 35/MWh)

The time periods t are defined as annual intervals up to a maximum of 20, which is a conservative renewable energy technology lifespan. The nominal interest rate i is approximated by the 20-year South African Treasury bond yield in the year of financial commitment. It is assumed that there will be no change to the structure and level of the electricity levy over the 20-year time period.

Accelerated Depreciation Allowance for Renewable Energy Assets

The annual financial benefit from the Accelerated Depreciation Allowance is projected on a nominal basis and denoted by $R_t(p,q)$: measured in ZAR:

$$R_t(p) = V_p * T * (A_t - S_t) \quad (4)$$

Where:

- V_p is the asset value of REIPPPP installation $p = \{1, 2, \ldots, 66\}$ in ZAR
- T is the corporate tax rate i.e. 28% sourced from SARS (2017)
- A_t is the accelerated depreciation deduction in year t e.g. 50% for t=1, 30% for t=2 etc.
- S_t is the straight line depreciation deduction in year t i.e. 5% for 20-year lifespan

The time periods t are defined as annual intervals up to a maximum of 20, which is a conservative renewable energy technology lifespan. The nominal interest rate i is approximated by the 20-year South African Treasury bond yield in the year of financial commitment. It is assumed that there will be no changes to the structure and level of the accelerated depreciation allowance over the 20-year time period.

Clean Development Mechanism (CDM)

The annual financial benefit for a registered CDM project p from earning CERs is projected on a nominal basis and denoted by $R_t(p)$ measured in ZAR:

$$R_t(p) = E_p * X_p \tag{4}$$

Where:

- E_p is the expected annual CER credits in tCO_2 avoided for registered CDM project $p = \{1, 2, \ldots, 14\}$
- X_p is the carbon price as defined in the CDM contract for registered project $p = \{1, 2, \ldots, 14\}$ measured in ZAR/tCO_2. If the price is not specified in the contract, it is estimated as an average of the available carbon prices for projects in the same year.

The time periods t are defined in each of the individual contracts as either 7 or 10 years. The nominal interest rate i is approximated by the 10-year South African Treasury bond yield in the year of financial commitment.

Section 12K Tax Exemption for amounts received or accrued from CERs

The annual financial benefit from the tax exemption on amounts received or accrued from CERs is projected on a nominal basis and denoted by $R_t(p)$ measured in ZAR:

$$R_t(p) = T * (E_p * X_p) \tag{4}$$

Where:

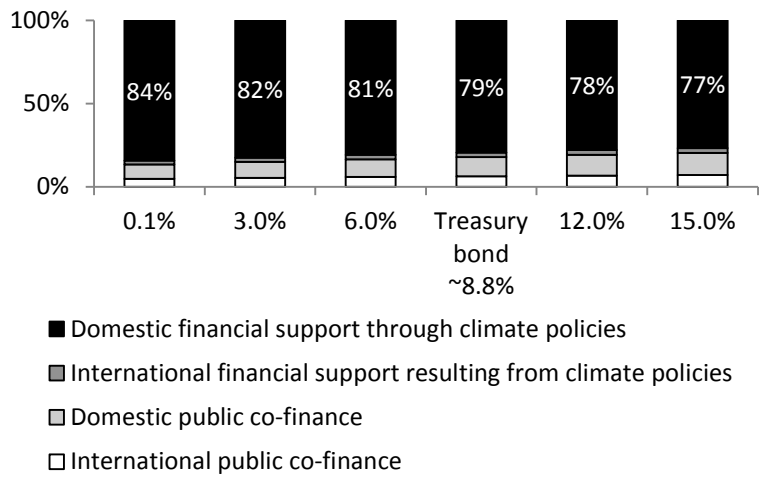
- E_p and X_p are as above
- T is the corporate tax rate i.e. 28% sourced from SARS (2017)

The time periods t are defined in each of the individual contracts as either 7 or 10 years. The nominal interest rate i is approximated by the 10-year South African Treasury bond yield in the year of financial commitment.

Box A7.2 Analysis of the sensitivity of results for the renewable energy sector to the choice of discount rate

All renewable energy policies considered in the *investor perspective* result in project-level financial support from and guaranteed by South African public actors. As such, the discount rate *i* is approximated by the South African Treasury bond yield of relevant maturity (i.e. 20 years, with an average yield of 8.8% over 2010 to 2015). This is a private discount rate reflecting the *investor perspective* that is considered. However, a social discount rate could arguably be used instead of a private discount rate, since they are typically used for the evaluation of public policies or projects that benefit society as a whole. On the other hand, since the value of financial support provided to a project is based on electricity output, the discount rate should arguably consider the riskiness of the project (e.g. by using the Weighted Average Cost of Capital (WACC)). Given the complexity involved in calculating the WACC for all projects, a sensitivity analysis to the choice of discount rate is performed. Results show that the conclusions reached in this report are robust to a wide range of possible discount rates ranging from 0.1% to 15%, as identified in relevant literature (see e.g. Donovan and Corbishley, 2016; IEA and NEA, 2015; IRENA, 2015). As shown in Figure A7.3, the share of mobilised private finance attributed to policies is materially unchanged across this range of discount rates.

Figure A7.3 Share of mobilised private finance attributed to public finance instruments according to volume-based pro-rated attribution, across discount rates (2010-2015, percentages)



Source: Analysis by authors based on data from a consultation with national financiers, bilateral and multilateral development finance institutions (2016), BNEF, Dealogic, IJGlobal, Thomson Reuters (2016), OECD DAC surveys (2016, 2015), IPP Office (2016), UNEP DTU (2017a; 2017b) and public announcements.

Energy Efficiency

A number of assumptions were made to analyse the effect of the 12i and 12L tax incentives on private investment in the energy efficiency field due to limited data availability and data gaps. Due to the different nature of the projects supported, the 12i and 12L tax incentives are considered to be additional to each other.

Project-level data for the 12i incentive was partially available for the 2010-2015 period through NT, although the year of each individual project was not available. The total 12i data were therefore equally spread between the six years under review. Furthermore, while the value of the tax incentive was available, the total value of the private energy efficiency-related investment was not provided. This was proxied using the qualifying project investment value that informs the value of the tax break provided to each project. Due to the nature of the projects supported, this value is likely to overestimate the value of the

energy efficient investment to some extent. While this overestimation increases the weight of the 12i incentive in the analysis, it does not impact the overall conclusions of the research.

Project-level data for the 12L incentive were also partially available from the inception of the scheme in 2013 to 2015 through NT. While the year of each individual project, the value of the tax incentive and the realised energy savings were available, the total value of the private investment was not provided. The total investment values were estimated using annual ratios calculated from data provided by NCPC-SA on potential energy efficiency opportunities identified through the RECP and IEE programmes (i.e. the ratio between energy savings in kWh and investment required) (NCPC-SA, 2017b). The following ratios are used in the analysis: USD 0.919 (ZAR 9) per kWh of energy savings in 2013; USD 1.189 (ZAR 13) in 2014; and USD 2.213 (ZAR 28) in 2015.

ANNEX 8. STAKEHOLDER CONSULTATION LIST

Key stakeholders were invited to participate in an online consultation to gather qualitative insights on factors that contributed towards enabling private investment in climate activities in South Africa. Such stakeholders represented a variety of organisations including multilateral, bilateral and domestic public finance providers (at both national and sub-national level), South African policymakers and policy implementers, domestic and international actors active in capacity building activities, as well as private sector banks, investment funds and project developers. The results of this survey were used to complement quantitative and qualitative analysis performed in Chapter 4. An indicative question from the consultation is shown in Figure A8.1. Overall, the consultation yielded 30 responses from 20 diverse institutions.

Figure A8.1 Indicative question from the qualitative consultation for the energy efficiency sector

Q18: In your opinion, to what extent did the following targeted domestic climate policies enable or hinder private sector investment in the energy efficiency sector in South Africa over the period 2010-2015?

Climate Policy	Major hindrance	Minor hindrance	Did not play a role	Minor enabling factor	Major enabling factor
IDM/EEDSM programmes (implemented by Eskom)	☐	☐	☐	☐	☐
The 12L Income Tax Allowance on Energy Efficiency	☐	☐	☐	☐	☐
The 12I Income Tax Allowance Incentive for manufacturing investments	☐	☐	☐	☐	☐
The labelling and performance standards (for buildings as well as electrical and electronic equipment)	☐	☐	☐	☐	☐
Other domestic climate policy (please specify in comment box below)	☐	☐	☐	☐	☐

Source: Authors.