

CLIMATE
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The Landscape of Climate Finance in Germany

Climate Policy Initiative

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Executive Summary

Background

A leader in the European transition to a decarbonized society, Germany has set ambitious targets for its contribution to the global fight against climate change. Through the 2010 Energy Concept (Energiekonzept) and 2011 decision about the Energy Transition (Energiewende), Germany has set goals to reduce greenhouse gas (GHG) emissions 80 to 95% below 1990 levels by 2050, and phase out nuclear energy by 2022 (BMW and BMU 2010; GoG 2011).

Achieving these objectives requires significant investments in renewable energy, energy efficiency, and other means of GHG emissions reductions. Public funds cannot finance this transition alone. Hence, it is crucial to understand 1) the current level of investment; 2) potential investment gaps; and 3) how public policies and finance can help create an environment conducive to private investment.

As a first step toward answering these questions, this study assesses how much money is being invested in Germany to reduce GHG emissions. By compiling data from a wide range of sources, we map finance flows along their life cycle, from their sources, to the intermediaries and financial instruments that are applied, to the sectors where the money is used. The result is a first comprehensive snapshot of climate finance in Germany in 2010.¹

1 We generally used data for the year 2010, which is the most recent year for which most of the relevant data is available. We used 2009 data for the industry sector, and for electrical appliances sales and price data from 2007 to 2012.

Who invested how much into what?

- 1. Our research suggests that at least EUR 37 billion,² or 1.5% of GDP, was invested in 2010 to support the German transition to a low-carbon economy.** This number includes full capital costs for renewable energy and incremental costs for all other investments. Figure ES-1, the German climate finance diagram (also known as the 'German spaghetti diagram') illustrates the current landscape of climate-specific finance flows along their life cycle.
- 2. The private sector provided more than 95% of climate finance in Germany, almost half of which was supported by concessionary loans from public banks. Thus, the public sector played an important role in supporting private investment.** The bulk of private money came from corporate investors (EUR 22 billion), led by corporations in the energy sector. Private households invested a significant EUR 14 billion.
- 3. Renewable energy generation accounted for the bulk of climate investment in 2010 with EUR 26.6 billion of total capital investment.** Households invested the largest share (37%), utilities, banks, and other financial investors in the energy sector invested 25%, farmers invested 20%, and industry and commerce invested the remaining 16%. Small-scale³ renewable projects, such as residential solar photovoltaic installations, dominated overall renewable energy investment, representing 75% of all investment in renewable energy, while large-scale projects accounted for the remaining 25%.
- 4. Energy efficiency amounted to EUR 7.2 billion of incremental investment.** Investments in efficient buildings and appliances accounted for the largest share of energy efficiency investment with EUR 5.8 billion.

2 This number only reflects EUR 0.8 billion of national public climate-specific finance. The German government however disbursed a total of EUR 1.2 billion in 2010. The numbers were derived differently. See Box 1 for a discussion of why we chose to use EUR 1.2 billion in the diagram and EUR 0.8 billion for our total climate-specific investment estimate.

3 For the purposes of this study, small-scale is defined as under 1 MW installed capacity. In 2010, 81% of solar PV capacity was under 1 MW, and 85% were roof-top installations.

Which key factors supported these investments?

- 1. The high share of private investment coincides with significant public incentives such as concessionary loans and the feed-in tariff.** During 2010, when the private sector channeled more than 70% of their climate-specific investments into renewable energy generation, corporations, households, and farmers had access to EUR 11.3 billion of concessionary loans to support their renewable energy investments.⁴ In 2010, the Feed-in Tariff (FiT) paid to household and corporate renewable energy generators amounted to approximately 13.1 billion.⁵ While this latter amount reflects payments for all renewable electricity fed into the grid in 2010 (and not just capacity built or financed in 2010), the magnitude of the FiT-related finance flow underlines the importance of this instrument for private renewable energy investments. The FiT is funded by the private sector via the FiT premium on electricity bills. Industry is largely exempt from this, leaving the bulk of the cost to households and small and medium enterprises.
- 2. Public banks played a key role by providing the concessionary loans described above.** These concessionary loans represented a 43% share of total investment in renewable energy, and 72% of investment in energy efficiency. The main beneficiaries were private households (KfW) and farmers (Rentenbank).⁶

Was information about climate finance in Germany readily available?

- 1. Climate finance is not systematically and comprehensively tracked** in public budgets or by the private sector. There is no established definition of climate-specific finance and — with some exceptions such as programs managed by the Environment Ministry (BMU) and KfW — there is no established process and no common framework for monitoring, reporting, and verification of climate-related expenditures.
- 2. There is no systematic and comprehensive assessment of the effectiveness of public (EU and German) climate finance** in achieving GHG emissions reductions, energy efficiency improvements, or renewable energy deployment. Only the effects of single programs (such as NKL or KfW programs) are being evaluated.
- 3. Difficulties in accounting for the incremental cost of renewable energy investments hamper comparability of different types of finance flows in Germany.** Due to these difficulties, our report takes both incremental costs (for energy efficiency and other non-energy related means of emission reduction) and investment capital (for renewable energy) into account. Additional efforts will be required to arrive at a comprehensive picture of German climate finance in terms of incremental costs and net flows.

This lack of information is a barrier to optimizing and further developing the most effective policy framework for mobilizing climate finance.

In order to **enhance the understanding of the effectiveness of climate finance efforts**, Germany as well as EU Funds need a more **comprehensive system of monitoring, reporting, and verification (MRV)**, which will require improved definitions, more coordinated finance tracking efforts, and more and better access to information.

4 The estimate is conservative in that it does not include concessionary loans from public state level banks.

5 The FiT affects cost-benefit ratios of renewable energy projects in Germany eligible for this tariff. Payments in relation to the FiT are considered separate from actual renewable energy investments in 2010.

6 KfW Bankengruppe and Rentenbank are German public banks.

Open questions and policy implications

Our report about the German climate finance landscape raises important questions with clear policy implications:

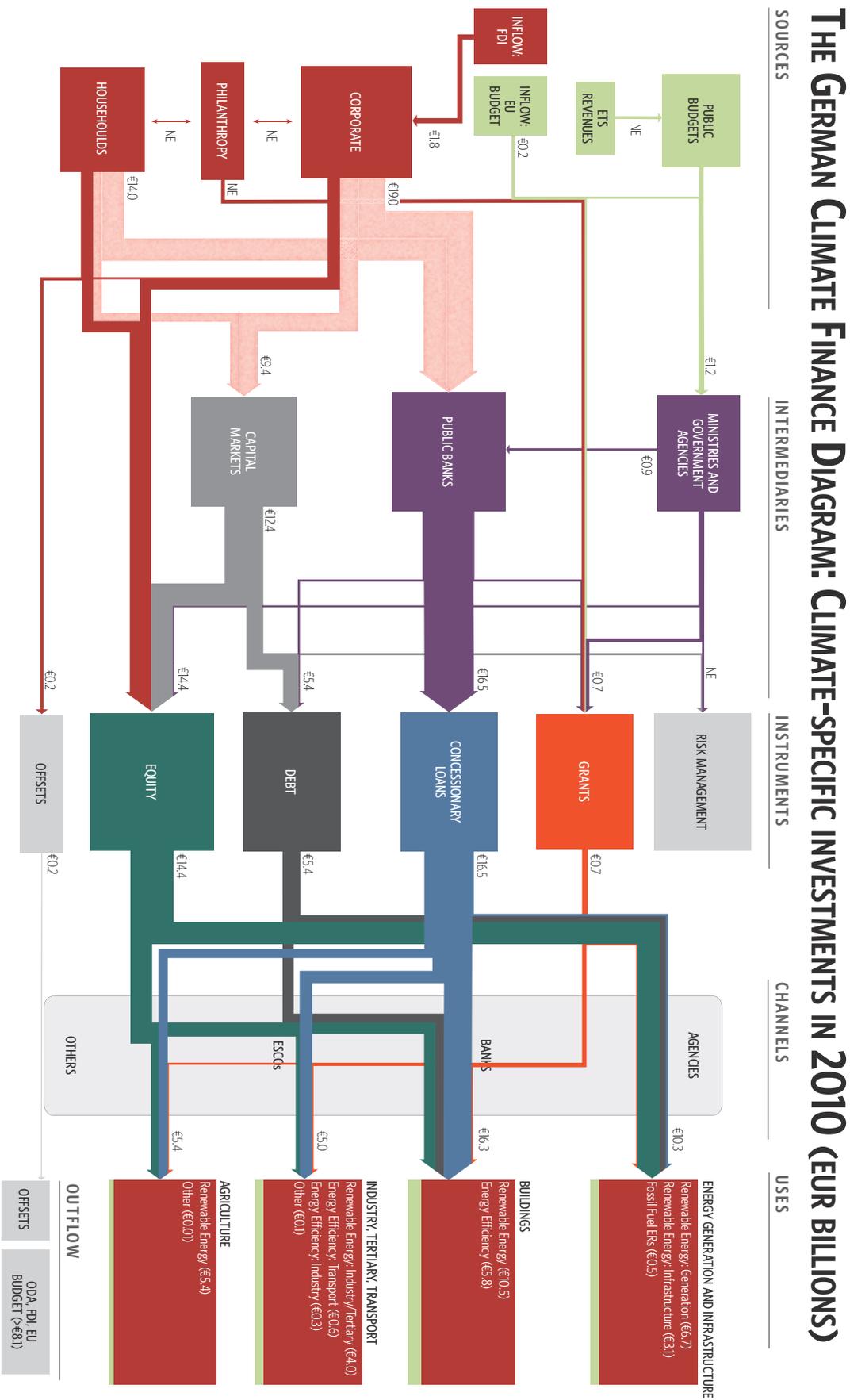
- **Is there a good balance between small- and large-scale renewable investments?** Large-scale renewable energy generation investments currently trail small-scale renewable energy investments. Further analysis is needed to understand whether a continuation of the current ratio represents a cost-effective approach to achieve the ambitious long-term renewable energy targets.
- **What is the optimal allocation between investments in renewable energy generation, and investments in electricity transmission and distribution networks?** Germany's ambitious energy and climate targets require both types of investments. Our estimates of energy sector investment suggest a potential imbalance, raising concerns as to whether electricity networks and their rate of expansion will be able to accommodate the expected growth of renewable energy at the available capacity. More analysis on this question is necessary.
- **Are financial flows being used effectively, and do they address the challenges posed by climate change?** The question of policy effectiveness (including the effectiveness of EU finance to Germany) is the biggest gap in Germany's climate finance landscape. To ensure that public money is spent wisely, and to mobilize additional private finance, we need a better understanding of the effectiveness of policy and financial instruments at EU, national, and sub-national levels.

Outlook

As the first comprehensive picture of climate finance flows in Germany, this study lays the groundwork for the academic, economic, and political discourse around German climate finance. It also takes the first step toward identifying key issues and solutions for climate finance tracking in Germany. A better understanding of the effectiveness of policy and financial instruments, including the role of different instrument mixes and how these instruments are viewed by different investors, will be fundamental for building an adequate and effective financing framework for the German *Energiewende*. In addition, rigorous monitoring, reporting, and verification, and systematic effectiveness analysis can assist learning, planning, and budgeting at the country level and drive effectiveness improvements in climate policy and finance.

CPI will continue to engage with partners and stakeholders to enhance the understanding and transparency of Germany's climate finance landscape.

Figure ES-1: The German Climate Finance Diagram: Climate specific investments in 2010 (EUR billions)



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1 Introduction and background

1.1 Why is this study important and what does it attempt to deliver?

Germany's Energy Concept (Energiekonzept) and Energy Transition (*Energiewende*) commit the country to ambitious climate and energy targets: to reduce greenhouse gas (GHG) emissions 80-95% below 1990 levels by 2050, and to phase out nuclear energy by 2022 (BMWi and BMU 2010; GoG 2011).

These ambitious policy objectives will require significant investments in renewable energy, energy efficiency, and other means of reducing GHG emissions. Public funds alone cannot finance this transition. Hence, it is crucial to understand 1) the current level of investment; 2) potential investment gaps; and 3) how public sources can facilitate and unlock private investment.

This study assesses how much money is being invested in Germany to reduce GHG emissions, with a focus on those investments relevant to the *Energiewende*. By compiling data from a wide range of sources, we map finance flows along their life cycle, from sources, via intermediaries and financial instruments, to the sectors where the money is used. The result is a comprehensive snapshot of the German Climate Finance Landscape (henceforth: the *Landscape*) in 2010.⁷

As the first comprehensive picture of climate finance flows in Germany, the *Landscape* lays the groundwork for the academic, economic, and political discourse around German climate finance. It also takes the first step toward identifying key issues for climate finance tracking and how to tackle them. This knowledge will be fundamental for building an adequate and effective financing framework for the German *Energiewende*.

7 2010 is the most recent year for which most of the relevant data has already been reported.

1.2 GHG emissions in Germany

In 2010, Germany emitted a total of 937 million tons of GHGs (UBA 2011),⁸ making it the sixth largest absolute carbon dioxide (CO₂) emitter in the world and the 26th largest in terms of CO₂ emissions per capita (IEA 2011).⁹

The energy sector¹⁰ is Germany's biggest emitter of GHGs, accounting for 38% of total emissions in 2010 (UBA 2011) due to a largely carbon-intensive energy mix: 55% of electricity generated from fossil fuels, 25% from nuclear, and nearly 17% from renewable sources¹¹ (BNetzA 2011). Because of this, sourcing energy from renewable sources has historically been the most

attractive option for reducing emissions in Germany. Year-on-year growth in new installed capacity of renewable energy between 1990 and 2000, and between 2000 and 2010 averaged 10.5% and 17.9%, respectively (BMU and AGEE-Stat 2012). In 2010, 75% of new installed capacity was renewable (BMWi 2012).

Final energy consumers typically fall into three sectors: households, trade, commerce and services¹² (ca. 44% of total final energy use¹³), industry (ca. 28%) and transport (ca. 28%) (in 2008, see:

Ziesing et al. 2011). Electricity use in these sectors contributes significantly to Germany's emissions: 16%, 13%, and 1%, respectively¹⁴ (UBA 2011).

GERMANY'S ECONOMIC SITUATION

Though 2010 saw the continuation of a global economic crisis, Germany's economy was recovering at a significant pace. Gross Domestic Product (GDP) increased by 3.7% (compared to 2009), risk premiums for inter-bank lending were down from their 2008 high of 180% but, fluctuating around 30%, were still way above the low 2007 levels. Growth of Gross Value Added (GVA) declined from 1.5% in the second quarter of 2010 to only around 0.5% in the fourth quarter. Investments in intermediate goods increased by 10.5% and in construction by 2.2% (GoG 2011; Fichtner et al. 2012). The effect of the economic context on German climate finance is outside the scope of our analysis.

- 8 Gases covered by the Kyoto Protocol: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (NO₂), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).
- 9 The UNFCCC does not require all its parties to submit annual GHG inventories. Hence only a comparison of CO₂ emissions is possible at the global level.
- 10 The energy sector covers energy generation and infrastructure.
- 11 This number excludes pumped storage hydro electricity.
- 12 The category households, trade, commerce and services includes agriculture, which represents 2% of total final energy consumptions.
- 13 Final energy consumption covers not only the usage of electricity and district heat, but also the utilization of coal, oil, gas, renewable energies, waste and waste heat.
- 14 Energy consumption in the conversion sector (coking plants, coal and lignite mines, briquette factories, power stations, petroleum and natural

1.3 Landmarks of German climate commitments

Climate change started attracting political attention in Germany in the mid-1980s (Weidner and Mez 2008). In 1990, the German government committed to reduce CO₂ emissions in West Germany 25% below 1987 levels by 2005 (GoG 1990). Five years after German unification in 1995, the government adopted a target for the unified country for the year 2005 of 25-30% below 1990 levels (Hatch 2007; Weidner and Mez 2008).

At the international level, under the 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), the European Community committed to an aggregate¹⁵ 8% GHG emission reduction below 1990 levels to be achieved in the 2008-2012 periods. This common European Community effort was shared through differentiated national targets for each member state. With a national reduction target of 21% Germany accepted the highest emissions reductions of all European Community member states. Moreover, Germany unilaterally pledged to reduce GHG emissions 40% below 1990 levels by 2020 (BMU 2003).

The 2007 Integrated Climate Protection Program¹⁶ (GoG 2007) aimed to double Germany's mitigation efforts and introduced a package of 29 key measures intended to enable the country to meet the 40% GHG emission reduction goal.

In 2008, the European Council and Parliament adopted the EU Climate Change and Energy Package (European Commission 2008), setting the EU-wide "20-20-20" targets for the year 2020: 20% reductions in GHG emissions and primary energy use below 1990 levels, and a 20% renewable energy share in gross final energy consumption. For allocating this effort to EU Member States, the Package separates emissions into those covered by the European Union Emissions Trading Scheme (ETS) and the non-ETS emissions. For the ETS emissions, a 21% reduction from 2005 to 2020

gas production, refineries, other energy producers) and flaring and transmission losses account for the remaining c. 8% of emissions in the energy sector Ziesing et al. (2011). Anwendungsbilanzen für die Endenergiesektoren in Deutschland im Jahr 2008 sowie Analyse zur Bestimmung des Bruttoendenergieverbrauchs. Berlin, Arbeitsgemeinschaft Energiebilanzen e.V.; Fraunhofer-Institut für System- und Innovationsforschung (Fraunhofer ISI); Technische Universität München; Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI).

15 That is, relative to the total emissions of the member states of the European Community in 1990.

16 Integrated Climate Protection Program (Integrierte Energie- und Klimaprogramm, IEKP)

is set for the whole EU-27, in annual steps of 1.74%. For non-ETS emissions, the Package sets country-by-country targets in 2020 relative to 2005 emissions in a bracket from -20 to +20%, taking into account the GDP per capita, which calls for a 14% reduction in German emissions.¹⁷

Within the 2010 Energy Concept, the German government reaffirmed its commitment to reduce GHG emissions 40% by 2020 and 80-95% by 2050 (BMW and BMU 2010). One year later, in the aftermath of the nuclear disaster at Fukushima Daiichi in Japan, the German government complemented its Energy Concept with its decision about the *Energiewende*, or Energy Transition (GoG 2011), which aims to meet energy and climate security challenges while simultaneously phasing out nuclear energy by 2022.

In addition to GHG emissions reduction targets, Germany has adopted a range of commitments that can ultimately be translated into GHG emission reductions. These commitments aim at reducing primary/final energy use, or at increasing shares of renewable energy in energy-consumption or in electricity generation. Sector-specific targets are discussed in more detail in the Sector annexes.

Table 1 summarizes Germany's climate-specific and climate-related targets; Figure 1 shows climate policy milestones and changes in GHG emissions by sector between 1990 and 2010.

Section 2 of this report presents the methodology. Section 3 explains the finance landscape from different perspectives, following the life cycle of German climate-specific finance flows from the sources to the final uses. Section 4 describes the challenges we encountered when trying to understand and track climate-specific investments in Germany and suggests ways to tackle these challenges. Finally, Section 5 summarizes the main conclusions of our assessment and closes by outlining the most important open questions and next steps. The annexes provide detailed information on data, methodology, and assumptions used in this report, including dedicated sections for key sectors.

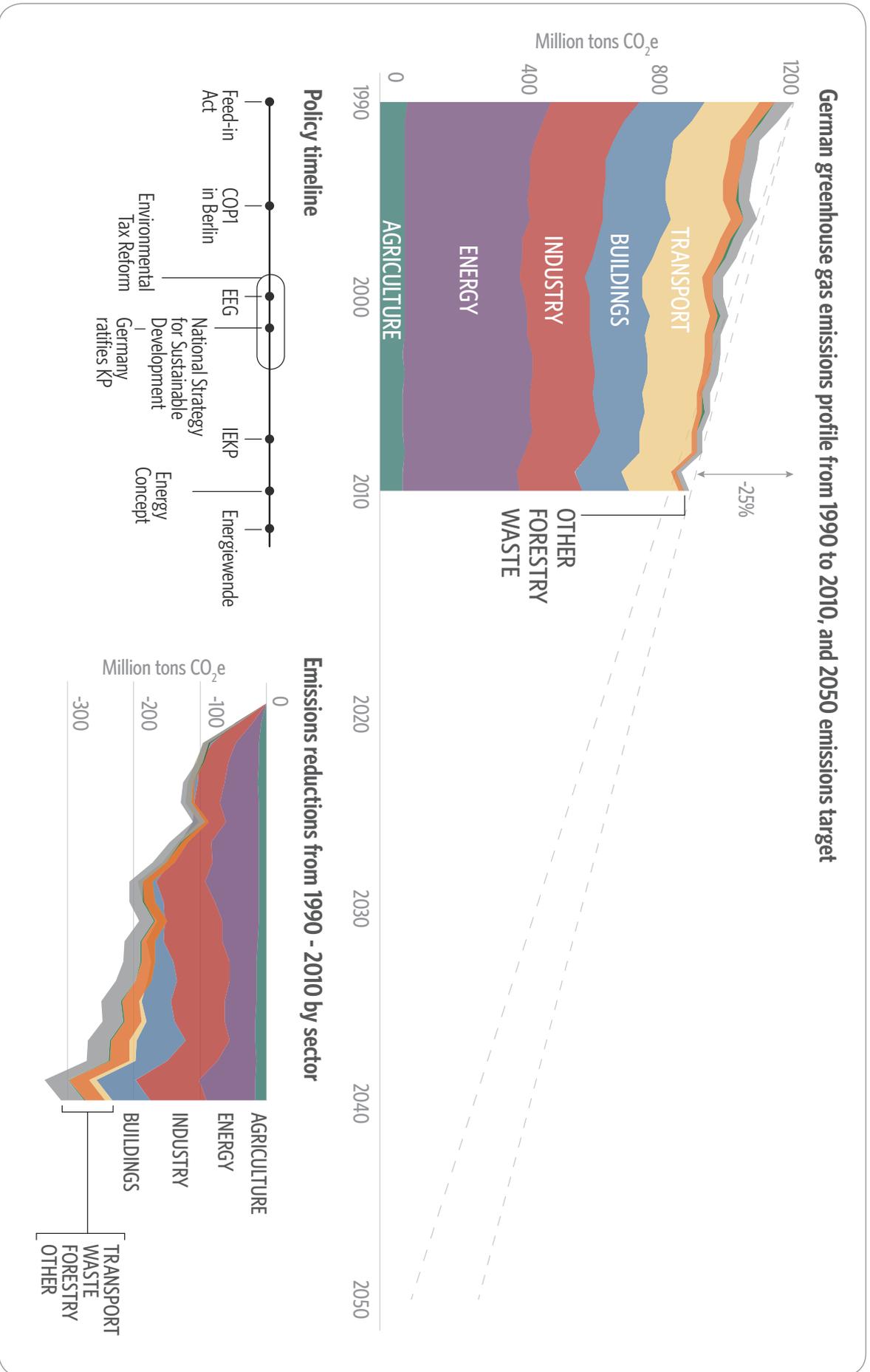
17 For a detailed description of these policies and the respective targets, refer to the website of the European Commission, which contains detailed explanations, all legal references as well as the underlying impact assessment. http://ec.europa.eu/clima/policies/package/index_en.htm

Table 1: Overview of the German (and EU) climate-specific targets^{1,2}

POLICY FRAMEWORKS	FRAMEWORK COMPONENTS	YEAR	TARGETS QUANTITY	IMPLEMENTING POLICIES AND SECTORAL COVERAGE							
				AGRICULTURE	TRANSPORT (EXCL. AVIATION)	BUILDINGS	INDUSTRY (NON-EU ETS)	INDUSTRY (EU ETS)	TRANSPORT (AVIATION)	ENERGY	
German targets set domestically											
German Energy Concept (BMW: and BMU 2010)	GHG emissions	2020	-0% (vs. 1990)								
		2050	-80-95% (vs. 1990)								
	Primary energy use	2020	-20% (vs. 2008)	Final energy use -10% in 2020 vs. 2005	Heat use: • 20% in 2020 vs. undetermined baseline	Primary energy demand: • 80% in 2050 vs. (as for 2020 above)			Renewable energy share in electricity generation: 35% in 2020 80% in 2050		
		2050	-50% (vs. 2008)	-40% in 2050 vs. 2005							
Electricity use	2020	-10% (vs. 2008)									
		2050	-25% (vs. 2008)								
EU-Wide Targets of EU Legislation				German Targets Implementing EU Legislation³							
	Total GHG emissions (ETS GHG emissions)	2020	-20% (vs. 1990) (- 21% (vs. 2005))	EU Effort Sharing decision Target allocated to Germany: - 14% non-EU ETS GHG reduction vs. 2005				EU Emission Trading Directive EU-wide ETS target: - 21% below 2005			
EU Energy and Climate Package (20/20/20) (European Commission 2008)	EU-effort sharing GHG emissions	2020	-10% (vs. 2005)								
	Renewable energy share in energy mix	2020	20%	EU Renewable Energy Directive German target: 18% in gross final energy consumption, including a 10% (for each member state) share of renewable energy in transport fuel consumption in 2020							
	Reduction of primary energy use	2020	20% (vs. 1990)	<table border="1"> <tr> <td>EU Energy Service Directive Target for each member state: energy savings as 9% of total energy sales in 2016 vs. 2001-054</td> <td></td> </tr> <tr> <td>EU Energy Efficiency Directive Individual energy efficiency target in 2020 are set by Member States Target (for each member state): utility obligation of 1.5%/yr. energy (sales) savings vs. recent 3 year-period</td> <td></td> </tr> </table>				EU Energy Service Directive Target for each member state: energy savings as 9% of total energy sales in 2016 vs. 2001-054		EU Energy Efficiency Directive Individual energy efficiency target in 2020 are set by Member States Target (for each member state): utility obligation of 1.5%/yr. energy (sales) savings vs. recent 3 year-period	
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EU Energy Efficiency Directive Individual energy efficiency target in 2020 are set by Member States Target (for each member state): utility obligation of 1.5%/yr. energy (sales) savings vs. recent 3 year-period											

1 Sector-specific targets are discussed in more detail in the Sector annexes.
 2 Emissions from waste are also covered by the Effort Sharing Decision, but are not explicitly discussed in this report.
 3 For the EU Effort Sharing Decision, Renewable Energy Directive and Emission Trading Directive, see European Commission (2009a).
 4 The Energy Service Directive is repealed by the Energy Efficiency Directive, but its Article 4, setting the target, remains in effect.

Figure 1: German GHG emissions (1990-2010) and milestones of German climate policy



Notes: COP = Conference of the Parties of UNFCCC; KP = Kyoto Protocol; EEG = Feed-in Tariff; IEKP = Integrated Energy and Climate Programme; LULUCF = Land-use, land-use-change and forestry; Energy = Energy generation and infrastructure; *GHG Emissions without LULUCF. Accounting for LULUCF the reduction 1990-2010 amounts to 22%. Between 1990 and 1995, the Industry and the Energy sector has decreased emissions by 14% respectively. Part of this reduction in the industry sector is due to the breakdown of industry in the former German Democratic Republic. Source: CPI based on GoG 1990; GoG 2007; Hahc 2007; European Commission 2008; Weidner and Mez 2008; BMWi and BMU 2010; GoG 2011; UBA 2011.

Table 2: Investment types covered by the study^a

	CLIMATE-SPECIFIC INVESTMENT		CLIMATE-RELATED INVESTMENT	
	INCREMENTAL COST	TOTAL CAPITAL INVESTMENT	INCREMENTAL COST	TOTAL CAPITAL INVESTMENT
TANGIBLE	Energy efficiency, non-energy related reduction measures	Renewable energy	Measures that deliver co-benefits in terms of emission reduction e.g. agri-environmental measures, investment in transport modal shift, etc.	
INTANGIBLE	R&D, information policies, training, and capacity building			
	Included in the German Climate Finance diagram		Included in discussion	

^a With the exception of renewable energy investment in the industry sector, where incremental investment data was available, and energy efficiency investment in the energy sector, where we could access only total capital investment data.

2 Methodology

Tracking and understanding climate-specific investment requires detailed information about the different stages of the finance life cycle: sources, intermediaries, financial instruments, disbursement channels, and recipients (or uses). Data, however, is often fragmented or not publically available. This section explains how we collected data under the given data and resource constraints.

2.1 Defining the research boundaries

This report analyzes climate-specific and climate-related investments flowing into, out of, or within Germany in the year 2010. It constitutes a first step toward systematically assessing, quantifying, and mapping the most important climate finance flows. Our long-term objective is to help close the information gaps identified during this first assessment and draw a full picture, or *Landscape*, of climate-specific finance in Germany.

To define the scope of this study we distinguish between the following types of investments: 1) climate-specific versus climate-related investments for mitigation purposes; 2) incremental versus capital investments; 3) tangible versus intangible investments. Table 2 shows which types of investments we cover in this study and provides examples of investment measures.

Climate-specific versus climate-related investments

Climate-specific investment¹⁸ refers to capital flows that target investments resulting in climate change

18 See Corfee-Morlot et al. (2009) or Buchner et al. (2011a) for a general definition, but note that this report excludes financing of climate resilience and adaptation.

mitigation or avoidance of emissions,¹⁹ for instance investing in renewable energy technologies. The *German Climate Finance Diagram*, also referred to as the “German spaghetti diagram,” focuses entirely on these flows (see Section 3 for a more detailed discussion).

Climate-related investments cover more general financial flows, which are not climate-specific but are either part of broader, multiple-purpose measures and/or are part of measures that deliver climate co-benefits in terms of reduction or avoidance of emissions.²⁰ Examples are the renovation of buildings, agri-environmental measures, and investments in railways. Climate-related investments are included in the sector-specific discussions and in Section 3. Adaptation and climate resilience are outside the scope of this paper, which focuses exclusively on climate change mitigation.

Incremental versus capital investments

Incremental costs refer to investments necessary to cover the difference, or “increment,” between the more carbon-intensive²¹ baseline option and a less carbon-intensive option (GEF 2010). For energy efficiency and non-energy-related emission reduction measures we either tracked incremental investments in climate-specific assets, or we calculated them based on assumptions discussed in Sector Annexes for each specific case

19 When considering or discussing emissions we refer to the definition of the United Nations Framework Convention on Climate Change (UNFCCC), according to which emissions comprise the following: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆). See www.unfccc.int.

20 In this report we do not use the category ‘climate-relevant’ as used in Buchner et al. (2011b) and defined as capital flows target economic growth in key emitting sectors and thus influence climate change outcomes, but possibly in a negative manner. Our climate-related category is different, as defined above.

21 Carbon-intensive is used here as representing the intensity of energy and non-energy related GHG emissions.

separately. In the limited amount of time available we tracked renewable energy investments at total capital cost. In fact, calculating incremental cost for renewable energy investments is challenging and requires dedicated and focused additional efforts in future work. These differences do not allow a direct comparison of investment volumes among different climate-specific categories.

Tangible versus intangible investments

We included only tangible investment flows in the *German Climate Finance Diagram*, such as investment in physical assets like machinery, equipment, or buildings. We excluded intangible, or “soft,” measures such as research and development, information, training, or capacity building from the *German Climate Finance Diagram*. We highlighted key intangible programs in Section 3 and in the Sector Annexes.

With few exceptions,²² we used 2010 data. When tracking climate-specific investments, we considered finance that was actually disbursed, not merely committed.²³ We tracked only primary investment flows, or investments that led to the creation of new or additional assets for mitigation purposes; we did not account for the cost of capital incurred by households and corporate investors. The “debt owed” does not reflect the cost of capital or debt repayment by households and companies, but rather highlights their role as investors and asset owners who make use of financial

instruments offered by public banks and the capital market.

We did not quantify the role of government guarantees provided to public banks and the grant-equivalent value of concessionary loans, with the exception of transfers from the national budget to the Kreditanstalt für Wiederaufbau (KfW)²⁴ to compensate for the opportunity cost incurred from concessionary interest rate buy-downs.²⁵ A precise quantification of these

instruments is likely to increase the share of public money in the compilation of climate-specific finance in Germany, and also adds to the significance of public finance in triggering private investment.

Allocation to climate-specific measures

Investments were allocated according to the sectors where the actual investment was made. Generally, we differentiated climate-specific investments that contribute to direct or indirect²⁶ GHG emissions reductions in Germany. Activities were split into three climate-specific categories, namely renewable energy, energy efficiency, and non-energy related

measures. Energy efficiency measures include investments into facilities (including buildings), production lines, and technologies leading to an increase of useful

FROM GLOBAL TO NATIONAL: BUILDING ON THE GLOBAL CLIMATE FINANCE LANDSCAPE

This report expands on a methodology presented in the 2011 CPI report “The Landscape of Climate Finance” (Buchner et al. 2011b), which examined global climate-specific finance flows in 2009/2010 and introduced a method of tracking the flows of climate investments along their life cycle. These flows were then mapped on a global climate finance diagram to provide a snapshot of climate finance, where it was used, and what route it took (see also Buchner et al. 2011b).

That report offered the first comprehensive picture of climate-specific financial flows between countries, their magnitude, and their nature. In comparison, the national scope of the *German Landscape* allows for a more detailed discussion of uses of finance. It also shows actual disbursement of funds rather than commitments.

22 We used 2009 data for the industry sector. We constructed a bottom-up estimate of electrical appliance investment in the buildings sector using market data on sales and prices of individual appliances in the period from 2007 until 2012.

23 Yet, multiannual commitments in 2010 into climate-specific budget lines represent important budgetary information because, for example, KfW's lending policy in 2010 for energy efficient buildings depends on these commitments. For the European Investment Bank (EIB), the KfW IPEX-Bank and the DEG (Deutsche Investitions- und Entwicklungsgesellschaft), commitment volumes are not included due to non-disclosed disbursement data.

24 Credit Agency for Reconstruction (Kreditanstalt für Wiederaufbau, KfW)

25 This grant equivalent value can represent two things. First, it is used to represent the value or opportunity cost incurred by the financial intermediary equivalent to the difference (or the “buy-down”) between market (or commercial) and concessionary interest rates. Public banks generally receive payments for this under specific budget lines defined for this purpose. Secondly, concessionary loans may also have a grant element (or repayment bonus) included (see also section 3.3.3 - Instruments)

26 Direct emissions are those emissions that are the consequence of activities within a given sector (i.e. sectoral direct fuel combustion; industrial process-related direct emissions of GHGs; or N₂O and CH₄ emissions from agriculture). Indirect emissions are emissions that occur in one sector although they result from activities in another sector (e.g. emissions associated with consumed electricity in buildings or industry that is accounted for in the emissions balance of the energy sector).

energy output over energy input. Non-energy related measures include other process- and production-related investments that do not improve heat or electricity use, but reduce direct emissions, for instance from chemical processes in industry, or by removal of carbon from the atmosphere through afforestation.

2.2 Analytical framework

Building upon Buchner et al. (2011b), we adopt a two-dimensional framework: First, flows are categorized alongside the life cycle of flows (sources, intermediaries, instruments, disbursement channels, and uses). Second, flows are categorized depending on their public or private nature.

Sources of finance capture information about where climate-specific investments come from. These are broken down into domestic public sources, domestic private sources, public EU funds, and private foreign direct investment (FDI). Public finance²⁷ covers EU Funds, national government, states (federal states), municipalities,²⁸ and associations of local authorities.²⁹ Private sources can be split into corporate,³⁰ household,³¹ and philanthropy.

Intermediaries include ministries, government agencies, public banks (such as KfW),³² commercial banks, or institutional investors. Their role is to facilitate the provision of finance from its initial sources to its uses, offering different financial instruments and sometimes using specific disbursement channels. As intermediaries, they may play the role of public or private financial administrators, finance lenders, contributors of expertise, or provide other services.³³

Instruments include grants, concessionary loans, risk management, equity, debt instruments such as commercial loans or bonds, and Kyoto Protocol (KP)

mechanisms.³⁴ They represent the different financial means of supporting climate-specific projects and measures. The definitions of instruments were developed based on (Buchner et al. 2011) and (OECD 2007). The use of a particular instrument varies with the type and size of the project and sector.

Disbursement channels (institutions that specialize in disbursement of finance) play a less prominent role in Germany than in international climate finance because most finance is disbursed by intermediaries (such as public banks, government agencies or ministries, as described above). Due to their limited role and the lack of reporting, we did not differentiate among different disbursement channels.

Uses correspond to sectors receiving climate finance. We segregated this category to allow differentiation between those sectors that are either major GHG emitters or energy consumers, and that are targeted by specific climate and energy policy, and finance, namely energy (including generation and infrastructure), industry, buildings, transport, agriculture, and others. We also calculate investments in renewable energy, in energy efficiency, and in non-energy related emission reductions for each sector. This allows us to derive, for instance, total renewable energy investment from sector-specific renewable energy investments.

27 As defined by the German Federal Statistical Office (Destatis 2012).

28 Data about investments at the state and municipal levels are so dispersed that they were only covered when reported at aggregate (national) level, which is done only for sub-national co-funding of EU Funds.

29 In addition, the public budget covers social insurance agencies and the employment agency. In this report, we do not track their contribution to climate-specific public finance.

30 The corporate category covers all sectors, i.e. energy, industry, the commercial sector and agriculture. For sector definitions, see Sector Annexes.

31 A private household is defined as any group of persons who live together and undertake economic activities, which typically finance their joint lives and household expenses.

32 Credit Agency for Reconstruction (Kreditanstalt für Wiederaufbau, KfW).

33 See Buchner et al. (2011b) for more information.

34 For a discussion of KP mechanisms see Buchner et al. (2011b).

2.3 Data sources used, data analysis, and limitations

We first identified organizations that track climate finance in Germany and reviewed their publications. We then established a framework for the Landscape. Finally, we created an in-house database³⁵ to identify, track, and merge all relevant financial flows from their sources to their destinations through any utilized intermediaries, financial instruments, and/or disbursement channels.

Data gathering

We gathered data primarily from information available in the public domain and often verified this data or further qualified it through personal interviews with experts. A summary of the sources used in the report can be found in the Sector Annexes. Depending on the structure of the sector, the nature of the mitigation measures, and the level of detail in sectoral data, we used either a detailed bottom-up approach (compiling data from the company, project, or technology level), or a top-down aggregation approach (using aggregate statistics and reports). We applied both approaches in the energy generation and infrastructure, buildings, and transport sectors. In the industry sector, we primarily used the aggregation approach.

Data analysis and limitations

One of the most important precautions when using data from various points along the finance flow was to avoid double counting (e.g. from German national budget reporting, total investment figures from sector reports, or lending volume from banks' annual reports). We mitigated this risk by adhering to consistent approaches to tracking, by applying assumptions consistently, and by providing transparency about our approach and our assumptions throughout the analysis.

When a project or a measure had multiple purposes and it was impossible to distinguish which part of the measure (or the underlying finance) related directly to climate change mitigation, we excluded it from the *German Climate Finance Diagram*. The most relevant programs are discussed in the text. To determine the climate-specific share of broader budget lines and their allocation to any of the climate-specific categories, we used expert opinion or other qualitative information

where available; otherwise we excluded them. Additionally, lack of data on investment in energy efficiency of commercial and public buildings contributes to a lower estimate of total energy efficiency investment. We acknowledge that this limitation might have created a bias that causes an underestimate of the investments in energy efficiency and non-energy-related reduction measures relative to renewables, which are often clearly financed for climate mitigation purposes.

Due to the substantial challenges in terms of data availability, we focused only on the most significant financial flows. Obtaining data on the financing for different sectors or the use of different financial instruments by commercial intermediaries posed the biggest challenge. Where we needed to split investment flows, for instance between several instruments or between sectors, we employed different assumptions, as explained in the Sector Annexes. We could not, however, split the renewable investments between industry and commerce, and hence these investments were tracked together. For efficiency improvements in fossil-fuel-based energy generation, it was not possible to determine the total investment because of complexities in reporting private investment. Similarly, it was not always possible to determine climate-specific investments in infrastructure (transport or energy infrastructure) because of its multi-purpose nature. As a result, we relied upon expert opinion to determine climate-specific investment in energy infrastructure.

35 This database represents one of the most valuable deliverables from this project. CPI will make this database available to ensure transparency of the data used in this report. We also hope to set incentives for stakeholders to join us in building up a complete database of future assessments of climate finance in Germany.

3 The German climate finance landscape

This section presents the key findings and results, highlighting which type of climate change mitigation measure and which sector receives German climate finance. To offer an overview, all flows are mapped in the *German Climate Finance Diagram* in Figure 2. This so-called German “spaghetti” diagram provides, for the first time, a comprehensive and systematic assessment of climate finance flows in Germany from sources to uses, along their financial life cycle. This snapshot of climate finance in the year 2010 offers the starting point for a much needed, evidence-based discussion and further in-depth assessments of the financial dimension of Germany’s Energy Transition. In this section we will explain the finance landscape from different perspectives, following the diagram from left to right. Section 3.2 highlights who finances investments in (tangible) assets that reduce GHG emissions in Germany across sectors of the economy. Section 3.3 illustrates the institutions and instruments that actors apply for their climate-specific investments. Section 3.4 completes the discussion of key findings and results, focusing on the uses of climate finance.

3.1 The German climate finance landscape diagram

The *German Climate Finance Diagram* (Figure 2; also known as the “German spaghetti diagram”) maps climate finance flows from source to destination in Germany for the year 2010.³⁶ Providing a first snapshot for the most recent year for which data was available, the flows include total capital investment in renewable energy and incremental investment in energy efficiency and non-energy related emission reduction measures.³⁷ As discussed in Section 1, this study focuses on gross flows because of the difficulty of calculating incremental cost and net values of all finance flows. We do not intend to compare the relative shares of different investment categories (energy efficiency and renewable energy), but rather provide a first overview of all major investment flows. As a next step, we aim to refine our methodology towards incremental investment, or the “net flows” approach.³⁸

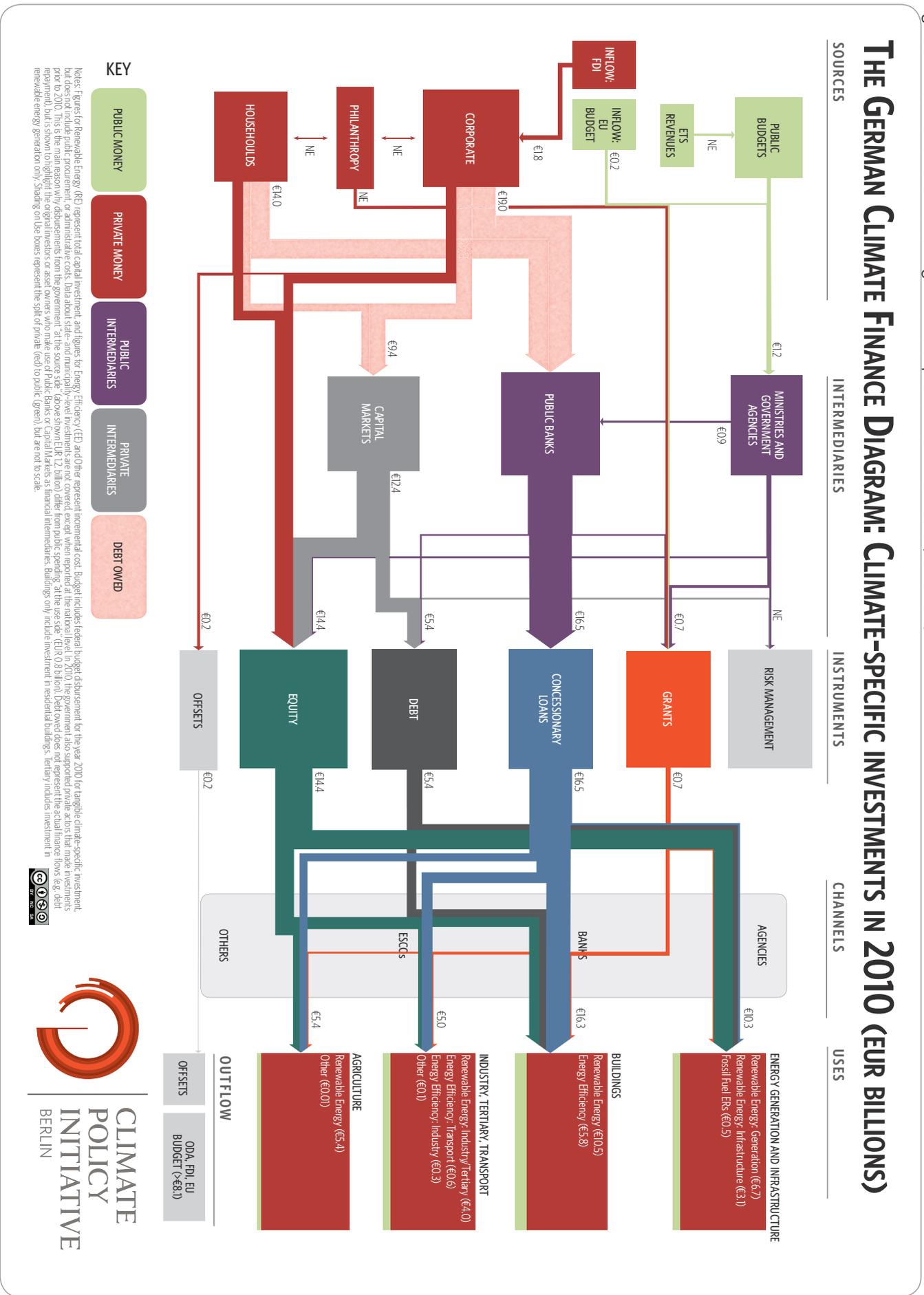
The following section presents the overall findings from the assessment of the climate finance flows, summarizing the role of different actors and delivery mechanisms in the Landscape.

36 We generally used data for the year 2010, which is the most recent year for which most of the relevant data is available. We used 2009 data for the industry sector, and 2007- 2011 data for electrical appliances.

37 Exceptions are: Renewable energy investment in the industry sector, which is incremental, and energy efficiency investment in the energy generation and infrastructure sector, which is total capital investment.

38 See section 4 for an overview of the data tracking issues encountered during this study.

Figure 2: The German Climate Finance Diagram: climate specific investments in 2010 (EUR billions)



3.2 The sources: Who invests and how much?

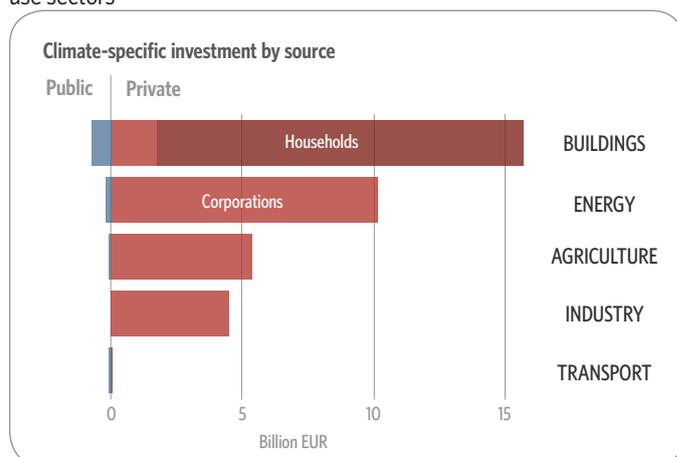
The private sector is the most important investor in climate-specific finance (Figure 3). Largely based on concessionary loans from public banks and commercial loans acquired on the capital markets, corporations and households invested some EUR 36 billion in climate-specific measures in 2010. Private foreign direct investment to Germany was EUR 1.8 billion.³⁹ Climate-specific public finance from EU and national budgets amounted to around EUR 1.4 billion.⁴⁰

Private Finance

The sum of all corporate finance⁴¹ amounts to EUR 22 billion and represents the highest share (59%) of climate-specific finance. These investments are spread across the economy, including corporations in the energy generation and infrastructure, industry, commercial, transport, and agricultural sectors (see Table 3).⁴²

Private households invested EUR 14.0 billion in 2010⁴³ (or 38% of total climate-specific finance). Total capital investment in renewable energy by households was EUR 9.9 billion,⁴⁴ and incremental investment in buildings' energy efficiency (including appliances) and energy efficient cars was EUR 4.1 billion. Households'

Figure 3: The split between public and private finance according to end-use sectors



investments were largely supported with concessionary loans by KfW.

Total foreign direct investment (FDI) into renewable energy in Germany amounted to EUR 1.8 billion in 2010⁴⁵ compared to EUR 12.9 billion of total foreign direct investment in the same year. According to the *Financial Times*' "The fDi Report 2012," renewable energy was the fastest-growing sector worldwide for FDI in 2011, with a 19.9% growth in the number of projects. Germany was among the top 10 global renewable energy FDI sources and among the top 10 renewable energy FDI destination countries (with a 9.5% and 3.3% global share respectively). In particular, Germany ranked second both as a FDI source country from Europe and as a FDI destination country in Europe, closely behind the UK (ibid.).⁴⁶

39 We assume that private foreign direct investment to Germany flows to corporate sources and we include this inflow under corporate sources in Figure 2.

40 Public spending does not include the "Energy Savings Program for Federal Public Buildings" (EUR 0.08 billion) and the share of the "Municipal Directive" of the "NKI" which went into public buildings (estimated EUR 0.01 billion). The reason is that it was not possible to determine the incremental share of climate-specific investments in non-residential buildings, as further explained in the buildings chapter of the Annex.

41 Our definition of 'corporate' is based on the Federal Statistical Office' definition (Destatis 2007).

42 Besides the official statistics, which only report climate-specific investments of industry and only a small share of the finance into commercial electrical efficiency provided by one public program, no aggregate sector statistics were available for corporate climate-specific investment in Germany. Individual contributions to not-for-profit organizations and foundations for climate-specific interventions could not be estimated.

43 This amount does not include grants or repayment bonuses from public sources or intermediaries.

44 Because of data limitations, these figures had to be derived from several sources (BMU and AGEE-Stat 2012, trend:research 2011, BNetzA 2011), primarily using the scale or size of installations in solar photovoltaic (which accounted for 80% of all new renewable capacity in 2010).

45 We converted USD 2.4 billion and USD 17.1 billion respectively to EUR by applying the EUR reference quotation for USD 1.3257:EUR 1 in 2010 (based on monthly averages), as published by the German Central Bank (Bundesbank 2012). Other sources used were the United Nations Conference on Trade and Development (UNCTAD) FDI database and the Financial Times fDi Intelligence database. The latter tracks cross-border greenfield investments and includes breakdowns on sectors and countries. It covers only new investment projects and significant expansion of existing projects. Greenfield projects account generally for the majority of FDI.

46 There is no agreed upon definition of climate-specific FDI.

Table 3: Climate-specific private sector investment in Germany split by actor and by measure type in 2010, billion EUR

SOURCE	RENEWABLE ENERGY (TOTAL CAPITAL INVESTMENT)		ENERGY EFFICIENCY (INCREMENTAL INVESTMENT)	NON-ENERGY RELATED (INCREMENTAL INVESTMENT)
	GENERATION	INFRASTRUCTURE		
HOUSEHOLDS	9.9	-	4.1	-
ENERGY SECTOR	6.6	3.0	0.5 ^a	-
INDUSTRY	0.1 ^b	-	0.3	0.1
COMMERCIAL SECTOR ^c	4.2	-	1.4	-
TRANSPORT	-	-	0.3	-
CORPORATIONS IN THE AGRICULTURE SECTOR	5.4	-	-	-
PHILANTHROPY ^d	NE	-	NE	-
TOTAL	26.1	3.0	6.7	0.1
FOREIGN DIRECT INVESTMENT (FDI)		1.8		

- a Energy efficiency in the energy sector is quantified as total capital investment
 - b Renewable energy in the industry sector is quantified as incremental investment
 - c The EUR 4.2 billion for generation include EUR 3.9 billion investment in renewable energy by both industry and commercial sector (split was not possible for this number due to lack of data), and EUR 0.3 billion investment into renewable energy by commercial investors in the residential buildings only. The EUR 1.4 billion for energy efficiency include investment by commercial investors in residential sector only.
 - d We include climate-specific philanthropic investments by households and corporations under the households and corporate investment categories, respectively. The total climate-specific funding from German foundations cannot be estimated because these groups are not required to release annual details on activities they support.
- Notes: Commercial sector investment here also includes commercial investment into residential buildings. FDI is already included under the corporate investments above and should not be added to the total.

Public Finance

In 2010, climate-specific public finance in Germany amounted to around EUR 1.4 billion,⁴⁷ with 86% from national budgets and 14% from the EU. Of the EUR 1.1 billion that we identified as public spending at the use side,⁴⁸ support went almost equally to renewable energy and infrastructure (51%) and energy efficiency (48%): 1% supported other types of climate-specific investment.

The German national budget invests EUR 1.2 billion in financing climate change mitigation primarily in form of allocations to federal ministries, which direct these funds to different budget lines. Ministries either incentivize private mitigation activities through public support programs or they invest directly in publicly-owned assets such as infrastructure or buildings (also called public procurement).⁴⁹

47 Public spending does not include the “Energy Savings Program for Federal Public Buildings” (EUR 0.08 billion) and the share of the “Municipal Directive” of the “NKI” which went into public buildings (estimated EUR 0.01 billion). The reason is that it was not possible to determine the incremental share of climate-specific investments in non-residential buildings, as further explained in the buildings chapter of the Annex.

48 See Box 1 for further information on national public spending data.

49 Climate-specific public procurement, e.g. for high-efficiency appliances, is underestimated in this report, because the government does not generally track the share of climate-specific spending in total procurement. State and municipal governments also provide climate-specific finance. While

State guarantees to the public banks play an important role in provision of public finance and facilitating private finance. Being the owner of a public bank, the federal government provides guarantees for the bank’s debt obligations. This makes it possible for the bank to raise money on the capital markets at a cost lower than commercial banks, and, consequently, lend at lower interest rates. In this study we did not quantify the role of federal guarantees, but we acknowledge the significance of this mechanism, which increases the share of public contribution in the total climate-specific investment.

The bulk of the EUR 230 million of EU funds for

climate finance in Germany⁵⁰ came from the European Regional Development Fund (ERDF); the European Agricultural Guarantee Fund (EAGF),⁵¹ and the European Agricultural Fund for Rural Development (EAFRD) under the Common Agriculture Policy (CAP); and the European Energy Program for Recovery (EEPR); and the LIFE+ program.⁵²

Climate-specific finance represents about 2% of the

their share in total government expenditure in Germany is relatively high, public finance from state or municipal budgets that was not tied to EU or national co-financing and hence reported in that context is currently not included, due to the lack of reporting of aggregate German numbers

50 This represents only the EU share. National co-funding is reported under German public finance below. This figure was calculated using our definition of climate-specific activities. While there have been a wide range of activities which relate to climate mitigation, we could not extract the share of climate-specific finance in it and therefore this finance was tracked as climate-related but it is not included into our climate-specific finance flow

51 Climate-specific finance provided by the European Agricultural Fund for Rural Development (EAFRD) under the European Rural Development Programme could generally not be identified, besides one budget line on energy crops.

52 Furthermore, research & development (R&D) and innovation in the area of climate mitigation received finance from the 7th Framework Research Programme (FP7), Trans-European Networks-Energy (TEN-E), and Information and Communications Technologies Policy Support (ICT) and Intelligent Energy Europe Programme (IEE) of Competitiveness and Innovation Framework Programme (CIP). See Box 5 on R&D investment coming from EU funds below for more details.

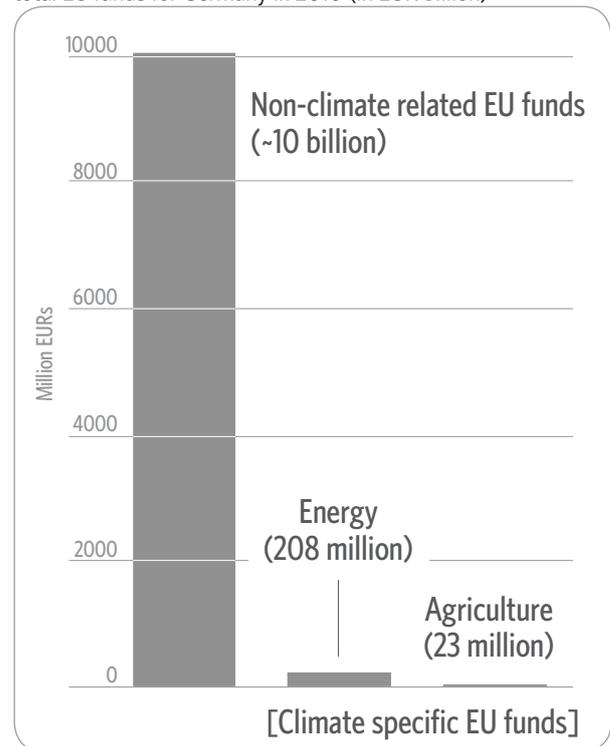
EUR 10.3 billion of total EU funds disbursed to Germany in 2010. EU climate-specific finance constitutes less than 1% of total climate-specific investment in Germany.

Figure 4 shows the share of sectors in total climate-specific finance from EU funds to Germany. The majority of projects and measures that receive support from these EU sources are co-funded from public federal and state budgets and may also receive additional municipal funds. For some measures, co-funding by private sector recipients is required. EU funds, as well as federal and state co-financing, are primarily in the form of grants.

The figures above seem to indicate that government institutions play a minor role in climate finance, given a public share in total climate finance of less than 5 percent. However, this total obscures the fact that **the public sector plays an important role in supporting private investments.**

The German government has a set of policies and actions in place that encourage investments (see Table 4 for an overview). These policies are not included in our finance figures, given that our *Landscape* focuses on actual primary finance flows, reflecting only government action and instruments that represent such flows (for example, concessionary loans, grants, or repayment bonuses),⁵³ Similarly, the *Landscape* includes only flows representing the financing of climate-specific tangible assets. Investments in intangible assets (such as information and capacity-building programs and research and development) are not included here, yet they represent an important activity of the public sector (see Boxes 2 and 5). In addition, the *Landscape* does not capture all public finance because climate-specific public procurement is (so far) rarely tracked by state and municipal governments and certainly not reported on aggregate for the whole of Germany. Moreover, the ownership structure of many investors in the buildings and energy sector is very difficult to determine. While we have allocated finance by non-governmental entities fully to the private sector, partial public ownership or shareholder ownership in some of these entities would require the allocation of a certain share of these investments to the public sector.

Figure 4: Climate-specific finance from EU funds compared to total EU funds for Germany in 2010 (in EUR billion)



Notes: Includes funding from European Regional Development Fund (ERDF), European Agricultural Guarantee Fund (EAGF), European Energy Programme for Recovery (EEPR), LIFE+ Program. This diagram compares all EU-Funds to climate specific funds. Climate-related investments such as railway infrastructure and bicycle lanes are not included. Source: CPI Calculations

53 Future work will explore through in-depth case studies which policies have been most effective in incentivizing private actors to invest in climate mitigation technologies.

Box 1: Data on national public spending

We are using two different numbers for German national public spending in our study: EUR 0.8 billion and EUR 1.2 billion. Below we briefly describe (1) what these numbers are and why they differ, and (2) why we chose to use EUR 0.8 billion instead of EUR 1.2 billion in our text and total sum of climate-specific investments. Last (3), we describe why EUR 1.2 billion appears in our landscape diagram (Figure 2) as an outflow from public budgets.

1. What do EUR 0.8 billion and EUR 1.2 billion refer to and why are they different?

EUR 0.8 billion refers to “*actual investments*” by public actors in energy efficiency and renewable energy. It was retrieved by, first, assessing total investments in energy efficiency and renewable energy in 2010 and second, analyzing which actors made such investments. It is hence a number constructed “at the use side,” the right side of the landscape diagram. It for example comprises grants and repayment bonuses given to households that invested in efficient residential buildings in 2010.

This number, however, differs from public spending constructed “at the source side,” amounting to EUR 1.2 billion (left side of diagram). The latter number was largely retrieved by analyzing budgets in 2010 and assessing which of the programs were climate specific. It relates to “*actual disbursements*” by the public sector. It differs from public spending at the use side, among other reasons, because the public also disbursed finance on programs that predominantly relate to support for pre-2010 investments, which hence does not appear at the use side in 2010. For example, more than 90% of the actual disbursements for the loan variant of the CO2 Rehabilitation Program in 2010 related to policy efforts and investments conducted in the years 2006-2009.

2. Why did we chose EUR 0.8 billion for our text and totals on climate specific investments in 2010?

We chose to use EUR 0.8 billion as part of our total investment in renewable energy and energy efficiency (climate specific investments) because it refers to an investment that actually took place in 2010. This is not the case for the EUR 1.2 billion.

3. Why did we still choose to use EUR 1.2 billion EUR as an outflow from public budgets to climate specific investments in our diagram?

We wanted to highlight at the left side of our landscape how much money was flowing out from public budgets to different intermediaries, instruments, etc. for climate-specific investments. Here, we chose to use actual disbursements because it highlights how much finance actually flowed out from public budgets in 2010, even if it was to support investments that were conducted prior to 2010.

Table 4: Germany's key policies encouraging climate-specific investments

SECTOR	POLICY	
ENERGY	Renewable Energy Act (<i>EEG</i>)	Introduced a Feed-in Tariff, a leading incentive for private sector investment in renewables. Importantly, it also obliges the network operator to 1) connect renewable energy sources, and 2) accept the resulting energy generated.
	Power Grid Expansion Act (<i>EnLAG</i>)	Identifies and helps facilitate investment into critical electricity infrastructure projects. Under development is a so-called "one-stop-shop" for approval and permitting processes of infrastructure investment.
	Network Development Plan (<i>Netzentwicklungsplan</i>)	A coordinated effort between the four German transmission system operators (TSOs) to organize grid investments over the next ten years, estimated at around EUR 20 billion in total.
INDUSTRY	Ecological tax reform	Encourages emission reduction measures via energy prices. ^a
	Tax exemptions and reductions (<i>Spitzenausgleich</i>)	Requires a mandatory implementation of energy management systems and a sector average reduction of energy intensity by an annual 1.3% as a precondition for tax exemptions/reductions (under discussion) ^b (compare, for example, Bauchmüller 2012; Vorholz 2012).
	EU Emissions Trading Scheme	Encourages emission reduction measures via carbon prices.
BUILDINGS	The Energy Savings Ordinance (<i>EnEv 2009</i>)	Demands minimum energy performance standards for buildings.
	Regulation for Renewable Energy in the Heat Sector (<i>EEWärmeG</i>)	Demands a minimum share of thermal energy from renewable sources.
TRANSPORT	EU CO ₂ targets for cars	Prescribe relative emissions intensity for car manufacturers, combined with penalties. ^c

^a See for instance: Kohlhaas, M. and B. Meyer, Eds. (2005), Eichhammer et al. (2011), GoG (2010).

^b Compare, for example, Bauchmüller (2012) and Vorholz (2012).

^c EU Commission (2011b, 2012c).

Box 2: Investment in intangible measures

Besides financing tangible investments, German public funds also support intangible or "soft" measures. Important examples of such measures are the following:

The Federal Ministry of Economics and Technology (BMWi) provides public support for energy audits of existing buildings. These audits are meant to encourage owners of residential buildings to pursue informed comprehensive retrofits of their buildings. In 2010, a total of 20,000 audits were conducted (BAFA 2011). Additionally, in August 2012, Environment Minister Peter Altmaier announced his plans to provide for new energy efficiency advisory services for households as part of the Federal Environment Ministry's (BMU) 10-point-program for 2012/2013. The Economics Ministry also provides support for other energy advice programs, such as energy audits of small and medium-size companies in cooperation with KfW.

The Environment Ministry offers a range of information programs for climate mitigation as part of the National Climate Initiative (NKI). The NKI supports programs such as the development of municipal energy concepts.

3.3 The role of financial intermediaries, instruments, and disbursement channels

Public and commercial banks are key finance providers across all the sectors. Concessionary loans provided through KfW, Rentenbank, and state banks represented 45% (or EUR 16.5 billion) of total capital investments in renewable energy and incremental investment into energy efficiency. Private financial intermediaries provided in total around EUR 12.4 billion EUR for climate-specific investments in Germany.

Finance from all sources is typically channelled through financial **intermediaries**, which offer or employ different financial **instruments** to make finance available for different uses.

Intermediaries

Public banks provided in total around EUR 16.5 billion for climate-specific investments in Germany.

Public intermediaries include ministries, governmental agencies (e.g. the Federal Office of Economics and Export Control BAFA⁵⁴), and public banks (e.g. KfW, European Investment Bank EIB). Public banks have a mandate from the government and are therefore driven by policy developments. Germany has two federal development banks (KfW and Rentenbank) and various state-level development banks.⁵⁵

- **KfW provided more than EUR 14.1 billion of concessionary loans in climate-specific, tangible assets in Germany in 2010.**⁵⁶ KfW is the largest public development bank in Germany with a total domestic lending volume in 2010 of EUR 64 billion and the key finance

provider⁵⁷ for climate change policies on the federal level.

- **Rentenbank provided more than EUR 2.3 billion of concessionary loans in climate-specific, tangible assets in Germany in 2010.** Rentenbank had a total promotional lending volume in 2010 of EUR 23 billion, and specializes in agriculture and rural development, offering loans (and to a much smaller degree grants) for sustainable agriculture and renewable energy (Rentenbank 2011).
- **The European Investment Bank (EIB) committed more than EUR 1.4 billion of loans in climate-specific, tangible assets in Germany in 2010,** mainly in the energy sector.⁵⁸

KfW and EIB are important sources of liquidity when it comes to large-scale projects, such as investments in wind farms, since these banks are able to provide large quantities of debt that would otherwise require several commercial banks or a consortium of banks. The EIB is also able to act as guarantor in special funds, for instance to set up a consortium of banks, specifically to target investment in immature technologies like offshore wind, and critical infrastructure projects like electricity interconnections. With expertise across the sectors and strong credit ratings, these banks reduce project risks and catalyse additional investment from private actors.

Private intermediaries provided in total around EUR 12.4 billion for climate-specific investments in Germany.

Private intermediaries include commercial banks and institutional investors.⁵⁹ These intermediaries are profit-driven and largely privately owned.⁶⁰ They raise money

54 Federal Office of Economics and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle, BAFA)

55 German states have development banks that are not required by the law but may still play a role in providing specific credit lines to support policy objectives. Finance provided by state development banks is not quantified in this study.

56 The total lending volumes of KfW in 2010 in Germany were EUR 8.9 billion for renewable energy, and at least EUR 9.8 billion for energy efficiency investments. For the energy efficiency measures we were able to quantify the incremental share of investment for the residential buildings only. As KfW loans do not necessarily cover the full project costs, the actual investment co-financed by KfW is higher.

57 In 2010, KfW supported more than 40% of total solar PV installations and 70% of wind energy investments in Germany. Half of all residential dwellings built in 2010 also received support for energy efficiency measures.

58 No disbursement data is provided for these tangible assets. Therefore, this climate-specific investment is not included in the diagram.

59 Institutional investors include insurance companies, pension funds, and investment funds (Gonnard et al. 2008).

60 Landesbanken are German-specific banks which are typically government owned or owned by savings banks (i.e. Sparkassen). However, Landesbanken are profit-driven and do not have any legal obligation to support governments in implementation of their policy objectives. For the purpose of this study, we include them in the commercial banking sector, as we did not quantify public investment at the state and municipality levels. Schäfer and Zimmermann (2009) count Landesbanken towards public banks.

on capital markets and from customers' deposits, and invest in climate-specific projects.⁶¹

- **Commercial banks (along with public banks) play an important role as finance providers,** since the major share of private investments across all of the sectors was initially financed through loans.⁶² They are typically involved in climate-specific investments in several ways. First, they provide debt for large-scale project finance, primarily for renewable energy and infrastructure, and corporate loans to companies across all sectors. Second, many banks also offer standardized loan programs to households and small and medium enterprises for renewable and energy efficiency measures, or make KfW programs available to customers.

Large commercial banks, such as Deutsche Bank, Commerzbank, Unicreditbank, and others, are also involved in climate-specific investments through their private wealth management and asset management subsidiaries. They are also involved in Kyoto Protocol mechanisms related to investment and carbon trading, but these are not primary investment flows.⁶³

- **Institutional investors were rarely involved in financing climate specific projects in 2010.** However, Allianz and Munich Re, the biggest German insurance and re-insurance companies respectively, have announced their intention to substantially expand their engagement in renewable energy financing in the coming years (Allianz 2012; MunichRe 2012).⁶⁴ Evidence from expert interviews suggests that renewable energy investments account for less than one percent of the total portfolio investment of insurance companies (Suess 2011). Insurance companies, as of 2012, have a capital base of EUR 1.28 trillion in Germany, but usually only enter at the later stages of renewable energy

investments, when projects are already operational and there is no additional construction risk.⁶⁵

Instruments

Concessionary loans provided by public banks represented the most important instrument, followed by equity and debt provided by private investors and commercial banks respectively. The other instruments used by public institutions either played a minor role (grants) or their role could not be estimated (risk management instruments).

Instruments reflect the financial means of supporting climate-specific projects and measures. The definitions of instruments were developed based on Buchner et al. (2011b).

- **Concessionary loans represented EUR 16.5 billion or 45% of German climate-specific investments in 2010.** Concessionary loans include loans provided at an interest rate below prevailing market rate; they may also include a grant element.⁶⁶
- **Equity represented EUR 14.4 billion, or 39%, of German climate-specific investments in 2010.** Equity reflects 1) capital contributions into stakeholder ownership, 2) market loans carried on the corporate balance sheets, and 3) household savings.
- **Debt represented EUR 5.4 billion, or 15%, of German climate-specific investments in 2010.** We include loans provided at market interest rates, bonds, and other debt instruments
- **Grants represented EUR 0.7 billion, or 2%, of German climate-specific investments in 2010.**⁶⁷ To estimate the total volume of grants, we collected transfers-in-cash or -in-kind where no legal debt was incurred by the recipient (compare methodology with Buchner et al. 2011b).
- **The role of risk management instruments**

⁶⁵ Institutional investments in climate-specific assets are generally not reported and were thus not quantifiable for 2010.

⁶⁶ For example, KfW programs for building energy efficiency provide loans with a grant element, or "repayment bonus," from 2.5% to 12.5% of total loan value if building is retrofitted to a certain energy performance standard.

⁶⁷ This does not include the co-financing of private parties.

⁶¹ Due to significant data limitations and the lack of reporting requirements or standards, it was impossible to determine the role of private intermediaries and their use of different instruments with any precision.

⁶² In this study we assume that corporate lending can be treated for 100% from equity due to the possibility of later capitalization of loans (balance sheet finance), i.e. recording loan value as assets of a company or its subsidiary. See Annex II for further details.

⁶³ Commercial banks' provision of climate-specific finance is generally not reported and thus not quantifiable.

⁶⁴ In addition to institutional investors calibrating their internal asset-liability strategy, two particular issues play a role in this regard, the unbundling rule of the EU energy market liberalization effort and the Solvency II directive for insurance companies.

could not be estimated.

Such instruments represent arrangements that reduce the risks of the investment, generate better credit ratings, and/or reduce the cost of capital such as guarantees, long-term export credits, and other finance enhancing instruments.

The use of a particular instrument varies across sectors and investors. The majority of German investments in the energy and infrastructure, industry, and buildings sectors were made through equity and loan programs for households and companies. Bond and share financing, which are primarily used for large-scale projects, played a minor role in financing climate-specific projects in 2010, while the major share of climate investment in Germany went to small-scale projects, such as thermal retrofits and roof-top solar PV installations.⁶⁸

Disbursement Channels

Disbursement channels make finance allocation decisions. Disbursement channels, as separate entities, play a less prominent role in Germany compared to international climate finance because disbursing finance is organized by intermediaries (such as public banks, government agencies or ministries, as described above). Examples of intermediaries that perform a disbursement role include BAFA,⁶⁹ the Agency for Renewable Resources (FNR)⁷⁰ or KfW.

68 Determining the instrument mix of different investment flows has been one of the most challenging tasks of this assessment, as the differentiation is generally not made explicit in the relevant and available datasets and reports, with the notable exception of KfW programs. Our estimates are based on the top-down investment data analysis, average sectoral debt and equity ratios and expert interviews (see Annex I and II for a more detailed breakdown of specific investments by sectors and the use of instruments).

69 Federal Office of Economics and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle, BAFA)

70 Agency for Renewable Resources (Fachagentur Nachwachsende Rohstoffe

Table 5: Climate-specific investments by sectors in Germany in 2010

SECTOR		CLIMATE-SPECIFIC INVESTMENT (BILLION EUR)			
		RENEWABLE ENERGY (TOTAL CAPITAL INVESTMENT)		ENERGY EFFICIENCY (INCREMENTAL INVESTMENT)	NON-ENERGY RELATED (INCREMENTAL INVESTMENT)
		GENERATION	INFRASTRUCTURE		
ENERGY	FOSSIL GENERATION EMISSION REDUCTION			0.5 ^a	
	RENEWABLE ENERGY (ONLY UTILITY SCALE)	6.7			
	ENERGY INFRASTRUCTURE		3.1		
BUILDINGS	RESIDENTIAL BUILDINGS AND APPLIANCES	10.5		5.8	
INDUSTRY/ TERTIARY/ TRANSPORT	INDUSTRY AND TERTIARY	4.0		0.3	0.1
	TRANSPORT			0.6	
AGRICULTURE	AGRICULTURE	5.4			0.01
TOTAL		26.6	3.1	7.2	0.1

^a Energy-efficiency investment in the energy sector could be quantified only in the total investment terms

3.4. What is climate finance in Germany used for?

Keeping in mind our use of full capital cost to track renewable energy finance and incremental cost to track energy efficiency finance, climate-specific investments for renewable energy activities in buildings, energy utilities, agriculture, and industry was EUR 26.6 billion. Investment in energy efficiency was EUR 7.2 billion, mainly in buildings, transport, and the industrial sector.

Table 5 shows how much climate-specific investment flowed into the various sector uses across the economy in Germany in 2010. The dominant share of renewable energy finance is from private sources (98%). Despite its large share of total GHG emissions (33%), we tracked comparably little climate-specific investment in industry. In addition to money invested in Germany, EUR 8.1 billion of climate-specific investment was used outside Germany.

The following section discusses the uses of climate finance sector by sector.

e.V., FNR)

Energy Generation and Infrastructure

Energy generation represents a significant share of Germany's total emissions, but offers many reduction opportunities: switching from high- to low-carbon generation, deploying renewable energy, or increasing demand-side participation. Driven by national and EU climate and energy policy, the generation portfolio and resulting emissions intensity is undergoing a period of significant transition.

With an energy portfolio that is primarily fossil-fuel-based, Germany's main approach to reducing the emissions intensity of the sector is the deployment of renewable energy. In 2010, 17% of electricity was generated from renewable energy sources, with the government targeting 35% by 2020, 50% by 2030 and 80% by 2050 (BMW and BMU 2010). The energy infrastructure network, through which gas and electricity is transported to end users, plays a critical role in meeting the country's low-carbon ambitions by accommodating increased volumes of renewable energy, and ensuring a secure and stable energy supply, and an efficient transmission and distribution system.

SECTORAL FINDINGS

- 1. Total capital investment into climate-specific measures in the German energy generation and infrastructure sector in 2010 was EUR 10.3 billion,** 98% of which was from private sources. Public finance came in the form of national and EU grants.
- 2. Renewable energy attracted the majority of climate-investment in the energy sector (EUR 6.7 billion renewable energy generation and EUR 3.1 billion in related infrastructure, or 95% of total capital investment in the sector) in 2010.** A further EUR 19.9 billion was invested into renewable energy in other sectors: buildings, industry, and commercial sectors (14.5 billion) and agriculture (5.4 billion). This brought total renewable energy generation across the economy to EUR 26.6 billion.
- 3. The large majority of investment in new generation in 2010 was in renewable energy sources, accounting for 75-80% of total new installed generating capacity in 2010.** Solar photovoltaic technology attracted large volumes of investment representing 77% of the total EUR 26.6 billion invested. As such, small-scale renewable energy investments were 75% of the overall

Table 6: Climate finance in the German energy sector in 2010 in million EUR

SOURCE	CLIMATE-SPECIFIC INVESTMENT (MILLION EUR)			CLIMATE RELATED
	ENERGY EFFICIENCY (TOTAL CAPITAL INVESTMENT)	RENEWABLE ENERGY (TOTAL CAPITAL INVESTMENT)	NON-ENERGY RELATED (INCREMENTAL INVESTMENT)	
PUBLIC	0	218	0	
PRIVATE	500	9,630	0	NE
TOTAL	500	9,848	0	

Note: Renewable energy investment includes generation and related infrastructure

EUR 26.6 billion invested, mostly from private households.

- 4. Tracking climate investments, and the associated investors, was challenging because of data limitations, a lack of agreed-upon reporting processes, and the difficulty in attributing investment to climate-specific measures.** Institutions such as industry associations (BDEW, Eurelectric, VKU)⁷¹ and regulatory agencies (BNetzA)⁷² can help improve climate finance tracking in the sector.
- 5. Energy policies, such as the Feed-in Tariff and the EU ETS, target increasing volumes of renewable energy investment and reducing emissions in the generation portfolio.** Germany appears to be on target to reach 35% of its electricity supply from renewable sources by 2020; in 2010 renewable energy supplied 17% of electricity. The FiT has been a leading factor in encouraging private sector investment in renewable energy. However, renewable energy investment has significantly outsized investment in infrastructure, which is a key element to meeting these policy objectives.

⁷¹ BDEW (Association of German Energy and Water Suppliers), Eurelectric (EU Association of Electricity Suppliers), VKU (German Association of Municipal Utilities).

⁷² German Federal Network Agency

Industry

The significant contribution of industry to national energy use and emissions highlights its key role in Germany’s low-carbon trajectory. Industry represented about 33% of Germany’s GHG emissions in 2010 (UBA 2011). Because of the variety and scale of companies and processes in the industry sector, many opportunities exist to reduce emissions.

Although the Energy Concept of 2010 does not set explicit targets to reduce industrial emissions, it does highlight the role of industrial energy efficiency in Germany’s low-carbon future (BMW and BMU 2010). Several important EU and German policies such as the EU Emissions Trading Scheme and Germany’s Environmental Tax Reform incentivize emission reductions in German industry.

Table 7: Climate finance in the German industry sector in 2009^a

SOURCE	CLIMATE-SPECIFIC INVESTMENT (MILLION EUR)			CLIMATE RELATED (INCREMENTAL INVESTMENT)
	ENERGY EFFICIENCY (INCREMENTAL INVESTMENT)	RENEWABLE ENERGY ^b (INCREMENTAL INVESTMENT)	NON-ENERGY RELATED (INCREMENTAL INVESTMENT)	
PUBLIC	NE	NE	NE	NE
PRIVATE	NE	NE	NE	NE
TOTAL	>342	>125	>111	1,019

^a While for all other sectors we used 2010 data, for industry the most recent data available was for 2009.

^b In the industry sector, renewable energy investment data was available only in incremental values.

tal Tax Reform are likely to influence private investments towards climate-specific measures.

A comprehensive assessment of climate-specific investments in the industry sector would need to consider the effects of such instruments.

SECTORAL FINDINGS

1. In 2009, 579 million EUR was invested into climate-specific measures⁷³ in the German industry sector. Although this investment volume represents solely the incremental share of climate-specific investment in the industry sector,⁷⁴ it seems rather small compared to the overall potential for climate-specific investment in Germany, especially when considering industry’s 33% share of emissions.

2. Most industrial climate-specific investment (59%) went to energy efficiency measures. 22% went to renewable energy and 19% to non-energy related GHG emission reduction measures.

3. Official statistics do not distinguish public finance from private investment, which makes it impossible to determine the share of either private or public actors in industrial climate-specific finance. In particular, private actors do not track the share of their investments in climate-related projects, e.g. energy efficiency. For them such investments are largely indistinguishable from “normal” expenditures in the re-investment cycle, such as acquisition of new equipment.

4. Policies such as the EU ETS or the Environmen-

73 For industry actors climate-specific investments are largely indistinguishable from “normal” investments as part of the re-investment cycle, in terms of new machinery for example.

74 In other words, the cost difference between the more carbon-intensive standard measure and a climate-friendly measure, see Chapter 2 for details.

Buildings

The building sector is a primary target for low-carbon investments, because it possesses significant potential to reduce the sector's energy consumption and GHG emissions, especially through improvements in energy efficiency (Schlomann, Eichhammer et al. 2012).

The Energy Concept contains a set of targets for thermal energy use in buildings (BMWi and BMU 2010). It requires a reduction of heat demand by 20% by 2020, and climate-neutral new buildings starting from 2020. By 2050, the Concept requires a reduction of primary energy demand by 80%, mainly to be achieved by retrofitting 2% of buildings each year.

The Concept does not set explicit targets for emission reductions associated with electrical efficiency improvements in buildings. It does however set a target for the reduction of German electricity use of 10% below 2008 levels in 2020 (and 25% in 2050). Targets and policies for electrical renewable energy have implications for the building sector as small-scale renewable energy is mostly installed on buildings. Table 8 shows a breakdown of finance in the building sector⁷⁵.

SECTORAL FINDINGS

- 1. In 2010, climate-specific investment in the German buildings sector was at least EUR 16.3 billion**, of which EUR 0.7 billion was public⁷⁶ and EUR 15.6 billion private (households and commerce).
- Of these, **EUR 10.5 billion was channeled to building-integrated renewable energy and EUR 5.8 billion to energy efficiency**. These numbers are structurally different; the former represents total capital investment while the latter represents incremental investments.
- KfW is the sector's most important financing institution**, channeling at least EUR 9.0 billion through concessionary loans and EUR 0.4 billion through grants and repayment bonuses to the building sector. Total KfW lending volume for

⁷⁵ The actual total climate-specific investments are likely to be higher, but their total volume is not estimated due to data limitations. Data gaps are most prominent for investments in efficient non-residential buildings and in renewable energy (see data in Sector Annex).

⁷⁶ This number reflects public spending estimated at the "use side". Total public disbursement at the source was EUR 1.1 billion. Box 1 explains why there is a difference between public spending data at the use and source side.

Table 8: Climate finance in the German buildings sector in 2010

SOURCE	CLIMATE-SPECIFIC INVESTMENT (MILLION EUR)			CLIMATE RELATED
	ENERGY EFFICIENCY (INCREMENTAL INVESTMENT)	RENEWABLE ENERGY (TOTAL CAPITAL INVESTMENT)	NON-ENERGY RELATED (INCREMENTAL INVESTMENT)	
PUBLIC	426	293	0	
PRIVATE	5,373	10,180	0	NE
TOTAL	5,799	10,474	0	

all programs covered by this report was EUR 13.2 billion. The difference occurs because KfW supports total capital investments for energy efficiency, while we only accounted for incremental investments.

- 4. Actual investment in buildings is higher**; our estimates predominantly cover investment in residential buildings. Other segments are not covered due to data gaps.
- 5. Energy consumption trends and retrofitting rates (among others) suggest that the current investment level is not sufficient to meet the Energy Concept targets.**

Transport

The transport sector accounted for 17% of German GHG emissions in 2010 (UBA 2011).⁷⁷ In 2009, the sector accounted for about 30% of final energy consumption; most of it (80%) can be allocated to road transport (AGEB 2011), which also accounts for 94% of CO₂ emissions in the transportation sector (UBA 2012).⁷⁸

Most transport-related policies in the Energy Concept focus on road transport.⁷⁹ The EU CO₂ targets for cars prescribe a car manufacturer's fleet average emission intensity to be below 130 g/km by 2015 and 95 g/km by 2020. Furthermore, the European Commission is currently considering an amendment to implement this 2020 target (European Commission 2009b).

Table 9: Climate finance in the German transport sector in 2010.

SOURCE	CLIMATE-SPECIFIC INVESTMENT (MILLION EUR)			CLIMATE RELATED (TOTAL CAPITAL INVESTMENT)
	ENERGY EFFICIENCY (INCREMENTAL INVESTMENT)	RENEWABLE ENERGY (TOTAL CAPITAL INVESTMENT)	NON-ENERGY RELATED (INCREMENTAL INVESTMENT)	
PUBLIC	84.6	-	NE	3,080
PRIVATE	184-767*	-	NE	>5**
TOTAL	268-851	-	NE	3,085

Notes: *Investment in efficient cars is in the range of EUR 109-401 million, dependent on the assumed range of cost per g CO₂/km between 15 to 95 Euro per g CO₂/km (see Annex Table 6.2)
 **For climate-related investments the share of private investments does not include the matching investments from grants and loans and is thus likely to be underestimated. Exact numbers for private sector climate-specific investments were not always available. The investment by the private sector was then derived from the grant conditions, for instance for the electric mobility and hydrogen projects.

SECTORAL FINDINGS

- In 2010, EUR 268-851 million, or on average EUR 559 million, was invested in climate-specific measures in the German transport sector.**
- Climate-specific investment in the transport sector is likely higher;** however, calculating the incremental climate share of climate-related infrastructure projects such as railways or bicycles poses difficulties. Climate-related investments were EUR 3.1 billion, covering the full capital costs of investments in railway, water, and bicycle infrastructure as well as investments in modal shift and combined transport.
- All of the climate-specific transport investments went into reducing energy demand** through energy efficiency assets such as efficient cars, and electric and hydrogen loading stations. **The main investment is the purchase of energy efficient passenger cars by private actors.**
- Public finance was mostly for electric mobility and hydrogen demonstration projects, and energy-efficient street lighting.**

77 This consists of 99.1% carbon dioxide (CO₂), 0.8% nitrous oxide (N₂O), and 0.1% methane (CH₄) (UBA, 2011).

78 Almost exclusively motor gasoline and diesel oil. Six per cent of road transport CO₂ emissions come from the combustion of biofuels (UBA 2012).

79 See Sector Annex for a list of sector targets.

Agriculture

The agriculture sector emitted 69.6 million tons CO₂-equivalent or 7% of total GHG emissions in 2010 (UBA 2011). Opportunities to reduce these emissions often involve changes in agricultural practices rather than investments in physical assets.

German agricultural policy and financing are dominated by the EU CAP⁸⁰ and the GAK⁸¹ policies. The German Energy Concept does not set explicit targets for agriculture but points to the potential opportunities for a more sustainable use of energy and for more efficient agriculture and forest management practices (BMWⁱ and BMU 2010). Public financing of rural development is primarily based on the European Agricultural Fund for Rural Development (EAFRD) and the German GAK (BMELV 2012).⁸² Table 10 shows a breakdown of climate finance in this sector.

Table 10: Climate finance in the German agriculture sector in 2010

SOURCE	CLIMATE-SPECIFIC INVESTMENT (MILLION EUR)			CLIMATE RELATED (INCREMENTAL INVESTMENT)
	ENERGY EFFICIENCY (INCREMENTAL INVESTMENT)	RENEWABLE ENERGY (TOTAL CAPITAL INVESTMENT)	NON-ENERGY RELATED (INCREMENTAL INVESTMENT ^a)	
PUBLIC	NE	22.6	11.7	180
PRIVATE	NE	5,357	NE	NE
TOTAL	NE	5,380	11.7	180

^a Data for private investment was not available for the non-energy related climate specific measures. The public figure represents neither incremental nor full costs, as it merely represents a subsidy. We are however treating these subsidies as incremental, as by their very definition they are paid to incentivize a measure (in this case afforestation) that would otherwise not take place. We have not estimated baseline investments in afforestation in the absence of the subsidy, but merely followed the logic of the support policy.

Note: Other non-energy related measures represent afforestation of previously non-forested land.

German government (at all levels) and the private sector do not report climate-specific investments in agriculture. The ongoing discussions of the future 2014-2020 EU CAP present an excellent opportunity for improving the monitoring and reporting of climate-specific finance in the agricultural sector.

SECTORAL FINDINGS

- In 2010, total climate-specific investments in the German agriculture sector were around EUR 5.4 billion** (EUR 5.4 billion from the private sector and less than EUR 35 million from the public sector).
- Total capital investment in renewable energy accounted for the largest share (EUR 5.4 billion)**, representing about 20% of total renewable energy investment in Germany; 98% of this was private investment, significantly supported by EUR 2.3 billion of concessionary loans from the agricultural *Rentenbank*.
- Afforestation and non-climate-specific agri-environmental land-use measures with mitigation potential received a mere EUR 180 million or 2% of total climate finance.**
- Broadly defined budget lines make tracking agricultural climate finance challenging.** Besides figures for biomass and bioenergy,⁸³ the EU, the

80 EU CAP: The EU's Common Agricultural Policy represents the common policy framework for all EU member states (including Germany). The CAP governs the bulk of EU funds directed toward the agricultural sector.

81 GAK (the Joint Scheme 'Improving agricultural structures and coastal protection') is the key domestic policy framework supporting agriculture and forestry, jointly administered and financed by national and state governments and municipalities.

82 and additional finance at the state and municipality level.

83 For example, support for non-food energy and non-energy related uses of

renewable resources.

4 Tracking climate finance: challenges and recommendations

Accurate climate finance tracking is essential for proper evaluation and optimization of national climate policy and financing frameworks. Rigorous monitoring and reporting can aid learning, planning, and budgeting at the country level and thus drive improved effectiveness. In our attempt to track climate finance in Germany, we identified challenges that spanned the German climate finance spectrum from sources to uses. This section recommends ways to address the most evident and important finance tracking challenges.

4.1 Key challenges

We identified four key tracking challenges, confirming some of the findings of CPI's 2011 Global Climate Finance Landscape (Buchner et al. 2011b):

1. **The German government and the European Commission do not systematically track national budget and EU contributions to climate-specific finance.** In fact, there is no EU-wide definition of climate-specific finance, not to mention one that is agreed upon internationally.
2. **Attributing public finance to climate-specific measures is challenging**, particularly because of two factors:
 - » It is generally difficult or impossible to separate climate-specific and climate-related funds from total investment in broad and multi-purpose programs and budget lines.
 - » Despite national requirements to consider energy efficiency in public procurement (GoG 2007), tracking for this is missing at all levels.
3. **The effectiveness of public (EU and German) climate finance in achieving GHG emission reductions⁸⁴ is not systematically assessed.** While some single programs (such as NKI⁸⁵ or KfW programs) are evaluated, there is no common monitoring, reporting, and verification framework that includes common climate finance effectiveness indicators.
4. **Tracking which financial instruments are used by which financial intermediaries for climate-specific activities is especially challenging** due to the lack of transparency and limited reporting of climate-

specific investments. This problem is particularly prevalent among commercial banks and institutional investors.

Section 4.2 summarizes some useful work on tracking climate finance carried out by a small number of institutions, and section 4.3 provides recommendations on how to address the identified tracking challenges.

4.2 Existing climate finance tracking efforts

We identified several attempts to track German climate-specific finance on the national, program, and sector levels.

National level

The Green Party develops its own proposal for the national climate protection budget on an annual basis, and compares it to government budget proposals (e.g. Kindler et al. 2012).

Oxford Economics, in a study for Ernst and Young, attempted to summarize public climate-related spending across a few countries including Germany, mainly based on Eurostat⁸⁶ data (Ernst and Young 2011). Oxford Economics labels both pollution abatement and general environmental protection research and development as climate-related spending, likely overestimating climate-related investment in Germany. Both of these categories include some non-climate-related spending.

The IEA systematically reports public research and development budgets for energy-related technologies based on national government submissions in (OECD and IEA 2012). BMU (2011) reports national public investment in renewable energy, but the reported figures differ from those in the IEA database.

Both BMU and BMZ track their share of the government's commitments to climate change mitigation overseas (BMZ 2012c). Oxfam provides a more detailed assessment (Kowalzig 2011) and ODI⁸⁷ published a methodological note on tracking public climate finance.

84 Reductions could include energy efficiency improvements, renewable energy deployment, or other direct measures

85 National Climate Initiative (German: Nationale Klimainitiative)

86 Eurostat however does not report climate-related investments.

87 The Overseas Development Institute (ODI) published a note on methodologies for tracking public investment in international climate mitigation: Bird et al. (2011).

Box 3 German Investment in overseas climate activities

German public and private investors are an important source of funding for international climate finance, equaling EUR 8.2 billion in 2010. Official Development Aid (ODA), financed through the public budget, and Foreign Direct Investment (FDI) as well as Kyoto offset purchases, financed through private actors, are included in the *German Climate Finance Diagram*.

The main forms of ODA are 1) public forms of aid, and 2) a portion of the German public budget that contributes to the EU public budget. In 2010, ODA amounted to at least EUR 1.4 billion:

- **Aid:** Of the national public budget, EUR 1.4 billion was directed into climate-specific ODA projects supporting overseas mitigation and adaptation projects, including the protection of forests and biodiversity. The majority, 78%, of these funds were channeled through bilateral programs, with the remainder through multilateral programs (15%), the International Climate Initiative (ICI) (6%), and Germany's Export Initiative Renewable Energy and Energy Efficiency (1%) (BMU and BMZ 2011, BMZ 2012a; 2012b, GoG 2012).
- **EU budget:** While the EU received EUR 23.7 billion from Germany in 2010 (European Commission 2011a), it was not possible to determine the share that was climate-specific, so we excluded this from the German Climate Finance Diagram.¹

German climate-specific FDI in renewable energy accounted for EUR 6.5 billion in 2010. While there is no definition for climate-specific FDI, i.e. corporate private investment in production activities outside of Germany, FDI flows in renewable electricity generation can be used as a proxy. For comparison, total German FDI outflows amounted to EUR 54.2 billion² (based on the UNCTAD Foreign Direct Investment and Financial Times fDi Intelligence databases³).

Offset purchases add between EUR 227 and 340 million to the German total private climate-specific overseas investment. German companies covered under the EU ETS surrendered 37.5 million Kyoto offset credits for a value of between EUR 225 and 300 million in 2010 (CITL 2011; Linacre and others 2011).⁴ Private voluntary offset purchases amounted to between EUR 2 and 40 million (Adelphi 2011).

- 1 It was similarly not possible to determine what share was climate-related investment. However, the European Commission plans to contribute at least 20% of the next EU budget 2014-2020 to finance climate-related projects (EU Commission 2011a).
- 2 We converted USD 8.6 billion and USD 71.9 billion respectively into EUR by applying the EUR reference quotation for USD, namely 1.3257 in 2010 (based on monthly averages), as published by the German Federal Bank (Bundesbank 2012).
- 3 The specific source is the Financial Times database, which tracks cross-border greenfield investments with sectors and countries breakdown details. It covers only new investment projects and significant expansions of existing projects. Greenfield projects account generally for the majority of FDIs.
- 4 In 2010, the KfW Carbon Fund purchased 9 million credits for a value of EUR 90 million (KfW 2011). These credits and make up a share of the volume of the credits surrendered in the EU ETS in 2010 by German companies. It is not possible to differentiate whether these credits have already been surrendered in 2010 or if ETS installations purchased credits for use in later years (i.e. banking of credits).

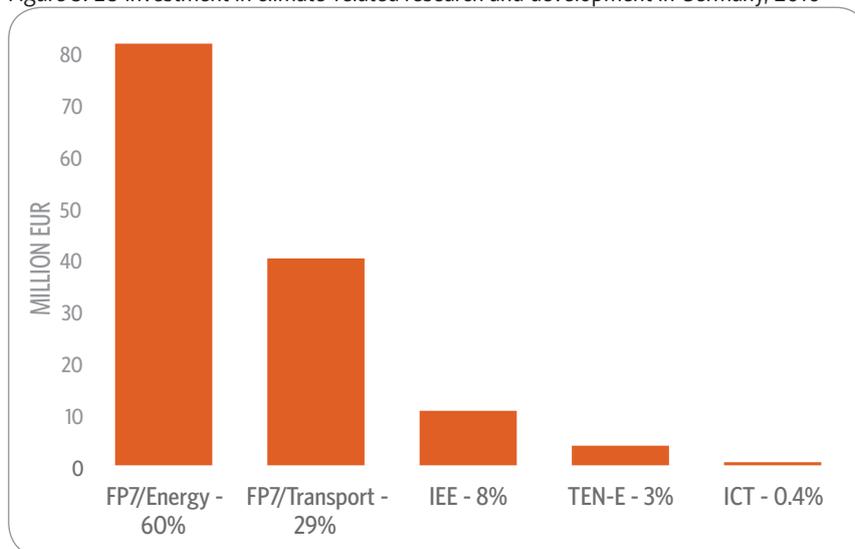
Box 4: EU budget support of research and development in Germany

In 2010, the EU budget transferred about EUR 143 million to Germany as grants to support climate-related research and development and innovation. The grants supported:

- Research and development in energy and transport, in support of the 7th Framework Research Programme (FP7)
- Innovations in all funding areas of the Intelligent Energy Europe program (IEE) of the Competitiveness and Innovation Framework Programme (CIP)
- Innovations in low carbon and smart mobility, as identified in the Information and Communications Technologies Policy Support (ICT) of the Competitiveness and Innovation Framework Programme (CIP)
- Feasibility studies in energy and transport infrastructure and renewable energy in support of the Trans-European Energy Networks (TEN-E).

The EU financing was conditional on national co-financing from public and/or private sources. For example, on average, FP7 projects were co-financed with an additional 33% of financing from national sources.

Figure 5: EU investment in climate-related research and development in Germany, 2010



Notes: FP7 = Sevenths Framework Research Programme; TEN-E = Trans-European Energy Networks; EE = Intelligent Energy Europe Programme; ICT = Information and Communications Technologies Policy Support. Source: based on personal communications and (European Commission 2011a, European Commission 2012b)

Box 5: National investment in research and development

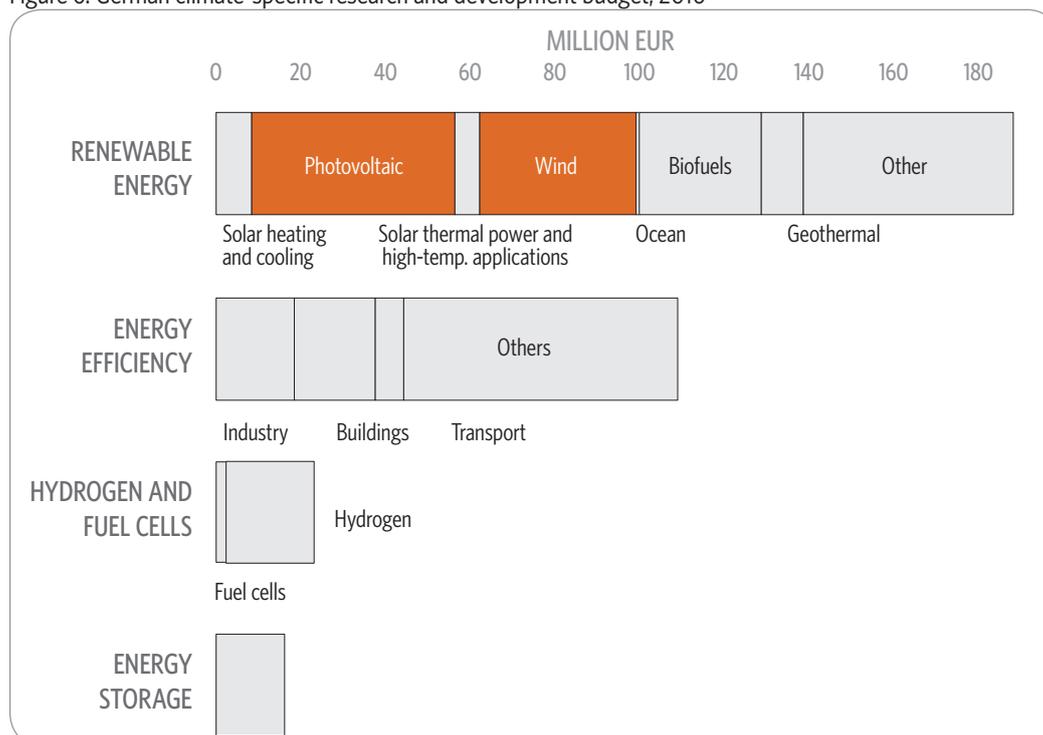
In 2010, the Germany's total climate-specific public research and development budget was EUR 610 million. The largest part of this budget supported renewable energy research and development (ca. EUR 187.5 million) followed by energy efficiency research and development (ca. EUR 108.6 million). Research and development investment in hydrogen and fuel cells was EUR 23.0 million, energy storage¹ investment was EUR 16.1 million, and finally CCS investment was EUR 12.9 million.

Solar energy received the largest share of research and development support compared with other renewable energy technologies (EUR 62.2 million), especially solar photovoltaic (EUR 47.8 million). Wind received the second largest share (EUR 36.7 million), followed by biofuels (EUR 28.7 million).

A significant share of energy-efficiency investment went to the building sector (EUR 19.1 million) and the industry sector (EUR 18.4 million), as well as to the transport sector (EUR 6.7 million).

1 This includes electrical storage, batteries/other electrochemical storage, electromagnetic storage, mechanical storage, other storage (excluding fuel cells), unallocated electrical storage, and thermal energy storage.

Figure 6: German climate-specific research and development budget, 2010



Source: (OECD and IEA 2012) Total renewable energy research and development investment reported by national statistics (BMU 2011) was lower than the corresponding data reported by the OECD/IEA Energy Technology RD&D database and cited in our estimate. While investment reported for solar thermal, wind, and geothermal research and development coincided in the two sources, the OECD/IEA cites higher figures for photovoltaic and unclassified renewable energy and includes ocean energy, biofuels, and renewable system integration which are not used by BMU (2011). The difference in these sources came to EUR 67.3 million. Notes: Biofuels include liquids, solids, and biogases. Buildings include residential and commercial structures, appliances, and equipment. 'Others' in energy efficiency relates to a range of techniques, processes, equipment and systems to optimize the management of energy not covered elsewhere.

Program level

German ministries commissioned projects to private contractors for evaluating various climate- and energy-relevant policies and programs.⁸⁸ These evaluation studies include estimates of the effectiveness of the programs in terms of GHG emission reduction and to some extent also private investment leverage and employment effects. The evaluation teams did not streamline their underlying methodologies and databases, but this would be useful and could potentially contribute to the development of a coherent approach to evaluating the effectiveness of German climate policy.

KfW renewable energy and energy efficiency programs are good examples of effective climate-specific tracking and reporting. Annual reports and program evaluation studies provide financing details by the type of technology that is funded. They also provide total investment and total emissions reductions without, however, estimating to what degree the programs trigger additional investments beyond what would have been invested in the absence of the programs.

Sector level

Heinze GmbH conducts an annual, comprehensive, bottom-up survey of investments in existing buildings (Hotze et al. 2011), which tracks energy-related investment, but with two limitations. First, the format of the study does not allow the climate-specific share of investments to be extracted from the total and, second, not all mitigation measures are studied.

The **Federal Statistical Office** (Destatis) publishes annual statistics about industrial climate-specific and climate-relevant investments (Destatis 2011). Although providing total investment volumes on a highly disaggregated industrial subsector level, these statistics do not differentiate between public and private spending.

The **German Insurance Association** (GDV) plans to

track the size of its members' investment in renewable energy measures through a survey.⁸⁹

In 2009, the **German Federal Motor Transport Authority** (KBA) started to publish monthly updates on the CO₂ efficiency of newly registered cars (Kba, 2010). Based on this information, combined with data on car purchase prices, KBA can estimate the total as well as the incremental investment by households and businesses in low-emission vehicles.

Table 11 provides an overview of the actors involved with tracking German climate-specific investment, mostly from a specific (sectoral) perspective. None of the areas is covered comprehensively, and the level of detail, differentiation, and sophistication varies significantly.

88 These efforts comprise among others the evaluations of national programmes such as: National Climate Initiative (NKI), Market Incentive Programme on Renewable Energy (MAP), Integrated Energy and Climate Programme (IEKP), Renewable Energy Sources Act (EEG) - Progress Report, and various policies targeting energy efficiency and energy savings under the Second National Energy Efficiency Action Plan (NEEAP). In addition, the European Database on Energy Efficiency Policies and Measures (MURE II) facilitates the simulation of the potential impact of various energy efficiency policies and measures in EU member states and enables a comparison across EU member states. See also Falconer et al. (2012) for a summary on Germany's overall reporting activities on GHG inventory and mitigation actions.

89 Personal communication with GDV 2012

Table 11: Overview of institutions tracking climate finance in Germany

SECTOR	GERMAN GOVERNMENT ^a & IGOs	FINANCE INSTITUTIONS	NOT-FOR-PROFIT (ASSOCIATIONS, NGOs)	ACADEMIA	PRIVATE SECTOR
AGRICULTURE	DVLR ^b				
BUILDINGS (EXCLUDING ELECTRICAL RENEWABLE ENERGY INSTALLATIONS)	Statistisches Bundesamt, JRC EC, BBSR, BMVBS, Berliner Energieagentur, BMU	KfW			Heinze GmbH
FOSSIL FUELS (EMISSION REDUCTIONS)	BMU, DENA, UBA, IEA			Öko-Institute, Wuppertal Institute, IÖW	BNEF, Generators
RENEWABLE ENERGY	BMU, DENA, JRC EC, UBA, IEA, UNEP-FS	KfW, Deutsche Bank	BDEW, REN21, ZSW, BEE, WWEA, EWEA, AGEE-Stat, Eurelectric	Wuppertal Institute, IÖW	BNEF, ECOFYS, GIZ, Generators
ENERGY INFRASTRUCTURE	BNetzA, DG Energy (European Commission)				Roland Berger, TSOs, DSOs
INDUSTRY	BMWi, BMU, JRC EC, DENA, Destatis	KfW, Deutsche Bank, Allianz, DZ Bank, etc.		Fraunhofer ISI, DIW	Roland Berger, Siemens Financial Services
TRANSPORT	BMWi, BMVBS, DG MOVE, BMU, BMV, KBA			Fraunhofer ISI	
INFLOW/ OUTFLOW	European Commission, BMZ, BMU, OECD, ODI		EU-Consent	Forschungszentrum Jülich	
CROSS-CUTTING	BMBF, DG Energy, UNEP-SEFI Bündnis 90/Die Grünen, IEA	Deutsche Bank, Allianz,		Wuppertal Institute, Forschungszentrum Jülich	Prequin, FHP Private Equity, Ernst & Young, Oxford Economics

a This column includes government agencies and public research institutions.

b German Network for Rural Development (*Deutsche Vernetzungsstelle Ländliche Räume*, DVLR)

4.3 Discussion and recommendations

Public sources: national and sub-national government and EU budgets

The lack of definitions of climate finance and the lack of systematic and comprehensive reporting at all levels of governance (most notably for EU Funds and for ministries other than BMU) pose fundamental challenges to tracking climate finance. These need to be addressed to enable a transparent representation of climate finance in Germany.

The agricultural, regional, and rural development funds report broad categories⁹⁰ without breaking down the investments at a meaningful level to assess outcomes. EU funds are administered at the state level and no aggregate reports are available for Germany.

Some national budget items target specific purposes, such as the Federal Ministry of Transport, Building, and Urban Development (BMVBS) CO₂-Retrofit Program, or programs administered by KfW. Conversely, others, such as the federal and state programs co-funded by EU sources (and administered under the “joint tasks”⁹¹) do not provide sufficient information to allow for a disaggregation of climate-specific public support. The effectiveness (i.e. outcomes) of climate finance is not measured systematically at the EU, national, or sub-national levels; this is only done for single programs or measures (such as KfW or NKI programs).

Recommendation 1: Set up a central registry and a streamlined annual report for all (EU, national, and sub-national) climate-specific public finance (and private co-financing) in Germany. This requires (ideally EU-wide) agreement on a common set of definitions of climate-specific and climate-related measures and finance, including on methods to calculate private co-financing. In order to assess investments against policy objectives, reporting 1) should differentiate energy efficiency, renewable energy, and non-energy-related emission reduction measures, and 2) should be in line with Energy Concept targets and part of the planned annual assessments.

The European Commission’s EU budget proposal for 2014-2020 (suggesting that 20% of the budget should be earmarked for climate action) is currently in discussion by EU member states and the European Parliament. It has triggered debates about the tracking of climate-specific finance in the EU budget⁹².

Recommendation 2: Improve the processes for deciding how to measure the impact of EU Funds, and how to define specific performance and outcome indicators, especially considering current discussions about the future EU budget.

90 Such as “direct payments”, “regional economic development per sector” or “agricultural investment”.

91 The joint tasks (or “Gemeinschaftsaufgaben”) for regional economic development (GRW) and agriculture and coastal protection (GAK) represent the German framework for funding aligned with the EU Funds mentioned above, administered jointly by the national and Länder governments.

92 The Commission’s proposal for the future Common Agricultural Policy for example foresees that “the impact of the common agricultural policy measures [...] shall be measured in relation to [a/o] [...] climate action, with a focus on greenhouse gas emissions, biodiversity, soil and water.”

Private sources - Household and Corporate Finance

To date, there are no common definitions for private climate-specific finance. Actors who invest in climate-specific measures, or those who track such investments, are typically not required or incentivized to report their (climate-specific) investments in detail (for instance, the type of technology; the differentiation between renewable energy, energy efficiency, or non-energy related emission reduction measures from general energy; or environmental or even broader investment categories)⁹³. Details regarding households and corporate climate-specific investments are thus hard to determine from the aggregate level data which is currently reported.

- Data for corporate investments in the energy sector are usually either at the group (but not at national) level, or aggregated across investments in renewable energy, emission reductions in conventional generation or, in some cases, grid infrastructure or at the aggregate level derived from sector associations⁹⁴ without differentiation between renewable energy/conventional/grid investments. For these reasons it was not possible to determine total specific emission reduction investments by these companies.
- In industry and commerce (as well as agriculture) climate-specific investments are largely indistinguishable from normal investments (e.g. a new engine may be a normal part of the re-investment cycle and not for climate reasons). The official statistics only comprise aggregate figures for climate-specific investments, not differentiating between the share of private finance and public support.

Recommendation 3: Improve transparency of the official statistics about industrial climate-specific investments by having the Federal Statistical Office (Destatis) change its official industry survey to make a distinction between climate-specific investments that are from public or private sources. Include agricultural enterprises in the same survey.

Recommendation 4: Encourage institutions to play a stronger role in climate finance tracking. BMWi would be in a position to survey climate finance in the energy and industry sectors. Sector associations⁹⁵ could play a lead role in this. The German Federal Network Agency (BNetzA) is in a position to 1) track the investor class (e.g. energy utility, industry, agriculture, or household) of all new renewable energy installations, or 2) regularly survey network operators to indicate reasons for investments, including those that are climate-specific.

Recommendation 5: Set up a system to track climate-specific investment by households and the commercial sector. For households and small and medium enterprises this could be implemented through a regular representative survey carried out by the responsible ministry. Alternatively, periodic evaluations of the energy consumption of households and the commercial sector⁹⁶ might be expanded to include also energy-cost-related information. Results should be released in a publicly available database.

93 This can be related to concerns about competitiveness and confidentiality. However, destatis (and Eurostat) have established procedures for addressing these concerns, for example by reporting only aggregate investment (at sector or national level for example).

94 For instance: BDEW (Association of German Energy and Water Suppliers), Eurelectric (EU Association of Electricity Suppliers), VKU (German Association of Municipal Utilities).

95 Like BDI (German industry Association), BDEW, DBV (German Farmers Association) and others.

96 For instance: Energieverbrauch des Sektors Gewerbe, Handel, Dienstleistungen (GHD) in Deutschland (different authors: Fraunhofer ISI, GfK, IREES) and The German Residential Energy Consumption Survey (different authors: Forsa, RWI, Fraunhofer ISI, DIW)

Financial intermediaries

The commercial banking sector, and the tracking of the financial instruments used in financing, represented the biggest tracking challenge for this study. Commercial banks track investments internally and typically only publish climate-specific finance volumes provided through their standard retail lending programs for households or small and medium enterprises. Information on climate-specific project finance or corporate loans is rarely released. Therefore, increasing reporting details on project finance would improve the transparency of tracking climate-specific investments by the banking sector.

Climate-specific investments by institutional investors, specifically in renewable energy, are usually reported as “infrastructure” investments and sometimes even under “real estate” (personal communication with GDV 2012, Schäfers, Dechant et al. 2012). Identifying climate-specific investments by insurance and pension funds is thus challenging. The German financial regulator BaFin does not require insurance companies to report investments in infrastructure nor specifically in renewable energy (BaFin 2012).⁹⁷ Individual insurance companies do not report their renewable energy investments.

In general, public (financial) intermediaries do differentiate their activities according to climate-specific investment categories. However, our evaluations and interviews showed that various definitions and boundaries for these categories exist across the public intermediary landscape.

Recommendation 6: Enhancing the effectiveness of public finance (and related policy instruments) requires an evaluation of the role and effectiveness of different financial flows. Adjust reporting standards⁹⁸ for private and public financial intermediaries to consistently differentiate climate-specific investment categories with corresponding policy objectives such as renewable energy, energy efficiency, or emission reductions targets.

⁹⁷ See also Nachweispflicht 670 which deals with reporting on assets held by insurance companies (BAFIN, 2011).

⁹⁸ Again, in so far as competitiveness and confidentiality issues are concerned, the reporting procedures of Destatis (and EUROSTAT) are able to effectively deal with this.

5 Conclusions

The objective of this work was to identify, track, and explain how much finance was invested in Germany in 2010 to reduce GHG emissions. This report constitutes a first overview, or *Landscape*, of German climate finance. By systematically assessing all available data sources and reports, and by quantifying and mapping the most important climate finance flows, we provide some early insights on how Germany is financing its transition to a low-carbon economy.

PRIVATE FINANCE IS KEY

The private sector played a dominant role, supported significantly by concessionary loans made available by KfW and the agricultural Rentenbank. The public sector plays thus an important role in supporting private investments. Private full capital investment in renewable energy and incremental investments in all other means of emission reduction amounted to EUR 36 billion, or more than 95%⁹⁹ of total climate-specific finance in Germany in 2010.

The largest share of these private investments (EUR 15.6 billion) went into buildings; two-thirds of this amount, or EUR 10.2 billion, financed renewable energy activities and one-third, or EUR 5.4 billion, financed energy efficiency activities.

RENEWABLE ENERGY ATTRACTS SIGNIFICANT INVESTMENTS

Renewable energy generation attracted EUR 26.6 billion of total capital investment in Germany in 2010. It was driven by investments from households (EUR 9.9 billion), farmers (EUR 5.4 billion), industry and commercial sectors (EUR 4.3 billion), energy utilities (EUR 3.6 billion), and banks and other financial investors (EUR 3 billion).

⁹⁹ This number corresponds to our total climate-specific investment figure of 37 billion, which does only reflect EUR 0.8 billion of national public climate-specific finance. The German government however disbursed a total of EUR 1.2 billion in 2010. These two numbers have been derived very differently. See Box 1 for a discussion of national public spending, explaining this difference, i.e. why we chose to use 1.2 in the diagram and 0.8 for our total climate-specific investment estimate.

Various policies may have incentivized households and corporations to invest in renewable energy. For example the Feed-in Tariff (FiT) that was paid to household and corporate renewable energy generators in 2010 was equivalent to approximately 50% of overall renewable investment in the same year.¹⁰⁰ While this amount reflects payments for all renewable electricity fed into the grid in 2010 (and not capacity built or financed in 2010), the magnitude of the FiT-related finance flow underlines the importance of this instrument.

INTERMEDIARIES AND INSTRUMENTS PLAY IMPORTANT ROLES

Public banks (such as KfW, the agricultural Rentenbank, and state banks) played a key role by providing concessionary loans for climate-specific investments. They provided EUR 16.5 billion in concessionary loans for climate-specific investments in Germany such as renewable energy and energy efficiency measures.

These concessionary loans represented a 43% share of total capital investment in renewable energy generation, and 72% of total incremental investment in energy efficiency. The main beneficiaries were private households (with concessionary loans from KfW) and agriculture (with concessionary loans mostly from Rentenbank).

Government loan guarantees for public banks offering these concessionary loans are another element of public support, the effect of which could, however, not be determined.

DATA GAPS HAMPER THE UNDERSTANDING OF CLIMATE FINANCE EFFECTIVENESS

Climate finance is not systematically and comprehensively tracked, either in public budgets or by the private sector. The effectiveness of public climate finance is only tracked anecdotally.

Public administrations at all levels—from EU to local—do not yet systematically track the contribution of their

¹⁰⁰ The feed-in tariff affects benefit cost ratios of renewable energy projects in Germany eligible for this tariff. We however do not consider payments in relation to the Feed-in Tariff in 2010 for our estimates of actual renewable energy investments in the same year.

budgets to climate-specific finance, which may lead to underestimating public climate-specific finance. There is no established definition of climate-specific finance and—with the exception of the Environment Ministry (BMU) and KfW—there is no established process for reporting climate-related expenditures by government ministries.

EU rural and regional economic development fund reporting also lacks transparency.

There is no systematic assessment of the effectiveness of public (EU and German) climate finance in achieving GHG emissions reductions, energy efficiency improvements, or renewable energy deployment. While the government evaluates single programs (such as NKL or KfW programs), no common framework for monitoring, reporting, and evaluation exists.

IS GERMANY ON TRACK?

Whether the EUR 37 billion of German climate finance means that Germany is on track to finance its ambitious targets cannot be determined. However, our tracking of the distribution of climate finance across different uses provides a basis for subsequent, more detailed explorations of issues relevant for addressing this question.

“Is there enough?” is definitely a question that comes to mind when talking about finance. Whether or not the EUR 37 billion of climate-specific finance in Germany was sufficient in 2010 in the context of Germany’s ambitious climate and energy targets is difficult to determine, as no comprehensive estimate is available for the total annual investments required for reaching these targets.¹⁰¹

As the Energy Concept calls for emissions reductions across all sectors of the economy, our findings can serve as a point of reference for estimating the additional efforts required.¹⁰² Our results show how much climate-

specific finance flowed into the different sectors in 2010 and will thus help to focus subsequent, more in-depth analysis.

Open questions and next steps

Our report raises a number of questions that need to be addressed to better understand how to most effectively finance Germany’s low-carbon transition. Based on the preliminary insights from this report, we intend to evaluate the effectiveness of the legal and policy framework governing German climate finance, including conditions that mobilize private sector finance. We will also provide analytical support to help improve the transparency and efficiency of the current monitoring and reporting regimes for public and private climate-specific finance.

To improve our understanding of any potential need to adjust German climate finance, a few issues in particular warrant further analysis:

- **A precise understanding of Germany’s net flows.** While our analysis reviewed incremental cost for energy efficiency and other non-energy related means of emission reduction, it would be useful to estimate incremental costs for renewable energy investments as well, in order to make all results comparable.
- **The right balance of small- to large-scale investments.** Large-scale renewable energy generation investments currently trail small-scale renewable energy investments, and it is unclear if the current ratio represents a cost-effective approach to achieve Germany’s ambitious long-term renewable energy targets. Further analysis is needed to determine the effect of incentives, policies, and other drivers on this balance between small- and large-scale projects.
- **The right balance between investment in renewable energy generation and investment in the expansion of electricity transmission and distribution networks.** Our figures for energy sector investment suggest a potential imbalance, raising concerns as to whether electricity networks and their rate of expansion will be able to accommodate the expected growth of renewable energy at available capacity. With a steadily increasing volume of variable energy supply on the network, system operators may

¹⁰¹ A report quoted regularly in this context is a background study commissioned by BMU for the German Energy Concept (ewi/gws/prognos 2010), which included estimates for investments required to reach the targets under different scenarios each compared to a baseline. It did not offer numbers on total investment.

¹⁰² Germany’s Energy Concept was adopted on 28 September 2010 and therefore is likely to have had little impact on climate-specific investments in that year. The preceding 2007 climate program IEKP however already largely incorporated the targets of the Energy Concept.

have to contract larger volumes of balancing services at ratepayer expense.¹⁰³

- **Scaling up energy efficiency finance. Energy efficiency in the building sector has significant mitigation potential.** In 2010, German retrofit rates were below the Energy Concept's retrofit target rate (for 2010 and after) of 2% of buildings per year. It would be useful to assess whether reaching this rate would require additional funding or other types of financial incentives. The lack of climate-specific investment reporting for non-residential buildings remains an important challenge to any future analysis in this area. Beyond buildings, existing finance models for energy efficiency may provide important lessons (including, for example, the UK's Green Deal).

To **ensure that public money is spent wisely** and to mobilize additional private finance, we need a better understanding of the effectiveness of policy and financial instruments and instrument mixes. This also includes improving our understanding of the accessibility or acceptance of policy and financial instruments by different types of investors. In particular:

- **Policy effectiveness, including leverage of private investment:** A small set of public policies and **programs (e.g. Feed-in Tariff and concessionary loans) appear to play a major role** in German climate-specific investment. A proper evaluation of the effects of these instruments along various dimensions, including on private investments, through in-depth empirical analysis could provide insights on how effectively financial flows are being used, and whether they address the challenges posed by climate change and global needs.
- **Interaction of policies in a portfolio:** Does the combination of Feed-in Tariff and the KfW concessionary loan program affect the investor risk to households or corporations differently? What is the role of other public policy and finance instruments such as the free energy efficiency advice proposed in the German environment minister's 10-point plan in August 2012?

- **Investors' finance and risk profiles:** Do policies like the Feed-in-Tariff properly reflect differences in investors' risk profiles and investment requirements (for example, households are driven by cost savings while corporations are profit-driven). How important are different expectations for the amortisation of the investment?

Finally, to **enhance the understanding of the effectiveness of climate finance efforts**, Germany as well as EU Funds need a more **comprehensive system of monitoring, reporting, and verification (MRV)**, which requires improving definitions, finance-tracking efforts, and filling related knowledge gaps.

CPI will continue to engage with partners and stakeholders to enhance the understanding of climate finance in Germany. Future work for CPI Berlin will include exploration of some of the questions listed above.

103 Utilising existing national and international infrastructure capacity through congestion management and balancing services for instance, as is possible in the power market design, can offer system balancing benefits, reduce infrastructure investment needs and assist with renewable energy integration (see CPI 2011-2012 <http://climatepolicyinitiative.org/berlin/publication/smart-power-market-project>).

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Annexes

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