Landscape of climate finance in Belgium

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TABLE OF CONTENT

Executive Summary: Landscape of climate finance in Belgium

The topic of climate finance has gained an increasing amount of attention recently as a result of the increased awareness of the risks of climate change and the Conference of the Parties (COP21) in Paris. In Belgium, the availability of sufficient climate finance is also an important topic because it is a key factor to enable the transition to a low-carbon economy. The Belgian government is particularly interested in opportunities to stimulate private sector financing of low-carbon initiatives. Additionally, a need to develop and build climate finance reporting capacity within the Belgian government has been identified as well as a need for a thorough understanding of the complexity of tracking methodologies and the significant impact of the choice for different tracking options. In this context, this study was launched to identify the investment streams related to climate change within Belgium. More specifically, investments in climate mitigation, adaptation and services are included that can be either primarily targeting climate goals (climate-specific) or as part of a broader set of goals (climate-related).

The key deliverable of this study is the Belgian Climate Finance Diagram which provides an overview of all identified investment streams adding up to a total of EUR 6.4 billion of climate finance within Belgium for the year 2013. The main sources of these investments are corporations (47%), public budgets incl. EU (34%) and households & SMEs (19%). Of the public budgets, 94% are Belgian public funding and 6% are EU public funding. The main instruments used for climate financing are equity (49%) and debt (16%) used by private sector investors and grants (10%), public investments (10%) and policy incentives (11%) used by public bodies. A key difference with for instance Germany is the low share of concessionary loans in Belgium (3% vs. 44% in Germany) which can be explained by the limited role of semi-public financial institutions in Belgium.

EUR 5.4 billion (84%) of Belgian climate finance is used for climate mitigation purposes which includes all investments related to energy efficiency, greenhouse gas emission reduction and renewable energy generation. These investment streams can be further subdivided into the following sectors:

1. Energy generation and grid infrastructure (54%): Mainly investments in renewable energy generation and combined heat and power (CHP).
2. Industry (4%): Mainly energy efficiency investments.
3. Buildings (26%): Mainly energy efficient retrofitting.
4. Transport (15%): Mainly related to modal shift.
5. Agriculture (1%): Mainly investments in energy efficiency and low-emission infrastructure.

The remainder of the Belgian climate finance is used for climate services (15%) and climate adaptation (1%). Climate services are mainly national R&D programs and climate-related corporate services such as consulting, energy management and carbon finance. Climate adaptation consists of public investments in water management and flood control. This financing stream is expected to increase in the coming years as the climate adaptation plans of the different regions were in the process of adoption in 2013.

In addition to the public finance instruments that are primarily focused on improving the yield of low carbon investments in order to make them profitable, various instruments are identified that aim to

remove other barriers that impede investments from being executed, although they are cost-effective from the private actor's point of view (indirect instruments). Within Belgium indirect instruments that are already utilised include energy audits, standardization and certification schemes, a regulatory framework for long-term investments in energy efficiency and renewable energy, risk reduction, access to finance and green loans. Furthermore, various best practices from other Member States are identified. Those include cases on energy performance contracting, (preferential) loans and savings obligations.

In collecting the climate finance data several challenges were observed such as the overlap between federal and regional measures that both target the same actors and activities. Furthermore, a framework with a clear set of indicators to follow-up and report on the implementation activities is lacking and the private sector is not incentivised to report on their investments. Those challenges make it hard to arrive at a clear view on climate financing in Belgium. Hence, it is recommended to install a central registry and a streamlined annual report for climate measures on all levels (EU, federal, regional, local)). Additionally, it is recommended to encourage stakeholders such as (public) institutions and sector associations to report more extensively on their results.

With respect to stimulating private sector investments that support a low-carbon pathway, several recommendations have been drafted for the Belgian government. It is recommended to continue supporting the incremental cost of energy efficiency measures and to keep combining public support and (voluntary) energy reduction programs. Investments in modal shift (e.g. in railways) are recommended especially for areas where they align with regional economic developments. For renewable resources the main recommendation is to offer a stable and predictable regulatory framework. Furthermore, recommendations are drafted to reduce the risk for investors in low carbon technologies and to encourage financial institutions to become more active in financing low carbon investments. Finally, new financing models like cooperative associations and crowd funding should be stimulated.

Samenvatting: Panorama van klimaatfinanciering in België

Door de toenemende bewustwording van de risico's van klimaatverandering en de recente media aandacht voor de klimaattop in Parijs (COP21), krijgt het onderwerp 'klimaatfinanciering' steeds meer aandacht. Ook in België is de beschikbaarheid van voldoende klimaatfinanciering een belangrijk onderwerp omdat het een essentiële voorwaarde is om de transitie naar een koolstofarme economie te kunnen maken. De Belgische overheid is hierbij specifiek geïnteresseerd in de mogelijke pistes om koolstofarme investeringen door de private sector te stimuleren. Verder heeft de Belgische overheid de behoefte vastgesteld om meer capaciteit te ontwikkelen en op te bouwen op het vlak van rapportering over klimaatfinanciering, alsook om op diepgaande wijze de verschillende complexe meetmethodologieën en de significante impact van de keuze van de verschillende opties hierin te begrijpen. Het is in deze context dat deze studie, met als hoofddoel het identificeren van de investeringsstromen met betrekking tot klimaatverandering in België, werd gelanceerd. De investeringen met betrekking tot zowel klimaatmitigatie, adaptatie als dienstverlening zijn in kaart gebracht. Hierbij worden zowel klimaatspecifieke investeringen (hoofdzakelijk gericht op specifieke klimaatdoelstellingen) als klimaatgerelateerde investeringen (onderdeel van een bredere groep klimaatdoelstellingen) meegenomen.

De belangrijkste uitkomst van deze studie is het 'Belgian Climate Finance Diagram': een overzicht van alle geïdentificeerde klimaatinvesteringen binnen België in 2013, die in totaal een bedrag van EUR 6,4 miljard vertegenwoordigen. De belangrijkste bronnen van deze investeringen zijn de bedrijven (47%), overheidsbudgetten incl. EU (34%), en huishoudens & KMO's (19%). Van de totale overheidsbudgetten, is 94% afkomstig van Belgische overheidsbudgetten en 6% van Europese overheidsbudgetten. De belangrijkste instrumenten die voor deze investeringen ingezet worden, zijn enerzijds eigen vermogen (49%) en leningen (16%), die door de private sector worden gebruikt, en anderzijds toelagen (10%), overheidsinvesteringen (10%) en beleidsstimulansen (11%), die door overheidsinstellingen worden gebruikt. Een belangrijk verschil met bijvoorbeeld Duitsland, is het klein aandeel van concessionele leningen (3% in België versus 44% in Duitsland). Dit kan verklaard worden door de beperkte rol van (semi) publieke financiële instellingen in België.

5,4 miljard euro (84%) van de Belgische klimaatfinanciering wordt gebruikt voor klimaatmitigatie doeleinden die onder andere alle investeringen in energie-efficiëntie, broeikasgasemissiereducties en hernieuwbare energieproductie omvatten. Deze investeringen kunnen verder onderverdeeld worden in:

1. Energieopwekking en -infrastructuur (54%): Voornamelijk investeringen in hernieuwbare energieproductie en CHP
2. Industrie (4%): Voornamelijk investeringen in energie-efficiëntie
3. Gebouwen (26%): Voornamelijk verbouwingen in relatie tot energie-efficiëntie
4. Transport (15%): Voornamelijk gelinkt aan de 'modal shift'
5. Landbouw (1%): Voornamelijk investeringen in energie-efficiëntie en koolstofarme infrastructuur.

De overige Belgische klimaatfinanciering wordt gebruikt voor klimaatgerelateerde dienstverlening (15%) en klimaatadaptatie (1%). Klimaatgerelateerde dienstverlening omvat voornamelijk nationale

onderzoeksprogramma's en klimaatgerelateerde private dienstverlening zoals consultancy, energiemanagement en koolstofmarktfinanciering. Klimaatadaptatie omvat met name overheidsinvesteringen in waterbeheer en overstromingscontrole. De omvang van deze investeringen zal naar verwachting de komende jaren toenemen aangezien de klimaatadaptatieplannen van de verschillende gewesten zich in 2013 in de goedkeuringsfase bevonden.

Naast de publieke financieringsinstrumenten die hoofdzakelijk bedoeld zijn om de rentabiliteit van koolstofarme investeringen te verhogen tot op een niveau dat deze rendabel zijn, zijn er ook verschillende instrumenten die zich richten op het verwijderen van andere barrières die investeringen belemmeren hoewel deze kostenefficiënt zijn (indirecte instrumenten). Hiervan worden in België al verschillende instrumenten gebruikt, waaronder energie audits, standaardisatie en certificatie schema's, een regelgevend kader voor lange termijninvesteringen in energie-efficiëntie en hernieuwbare energie, risicoverlaging, toegang tot financiering en groene leningen. Hiernaast werden verschillende 'best practices' in andere lidstaten geïdentificeerd. Deze omvatten voorbeelden van het gebruik van energie prestatiecontracten, (preferentiële) leningen en verplichte besparingsprogramma's.

Bij het verzamelen van de klimaatfinancieringsdata, zijn verschillende uitdagingen aan het licht gekomen, zoals federale en gewestelijke maatregelen die zich beide richten op dezelfde actoren en activiteiten maar die elkaar overlappen. Verder ontbreekt er een kader met duidelijke indicatoren om de voortgang van de implementatie van de verschillende activiteiten te monitoren en wordt de private sector niet aangemoedigd om hun klimaatinvesteringen te rapporteren. Door deze uitdagingen is het moeilijker om een duidelijk beeld van klimaatfinanciering in België te verkrijgen. Zodoende is een van de aanbevelingen om een centraal register en een gestroomlijnd jaarrapport op te zetten om over klimaatmaatregelen op alle niveaus (EU, federaal, regionaal en lokaal) te rapporteren. Bovendien wordt aanbevolen om de stakeholders zoals (publieke) instellingen en brancheorganisaties aan te moedigen om uitgebreider te rapporteren over hun resultaten.

Wat betreft het stimuleren van investeringen in een koolstofarme toekomst door de private sector, worden verschillende aanbevelingen voor de Belgische overheid geformuleerd. Zo wordt aanbevolen om de ondersteuning van de incrementele kosten voor energie-efficiënte maatregelen door te zetten en om overheidssteun en vrijwillige energiebesparingsprogramma's te blijven combineren. Investeringen om een 'modal shift' te bewerkstelligen (bijvoorbeeld in het spoor) worden vooral aanbevolen in domeinen waar deze samen gaan met regionale economische ontwikkelingen. Voor hernieuwbare bronnen is de belangrijkste aanbeveling om een stabiel en voorspelbaar regelgevend kader te bieden. Verder zijn er aanbevelingen geformuleerd om de risico's voor investeerders in koolstofarme technologieën te verlagen en om financiële instellingen aan te moedigen om meer koolstofarme investeringen te financieren. Tot slot wordt aanbevolen om nieuwe financieringsmodellen zoals coöperatieven en 'crowd funding' te stimuleren.

Résumé : Panorama des financements climat en Belgique

Le sujet du financement de la lutte contre le réchauffement climatique suscite ces derniers temps de plus en plus d'attention, suite à la prise de conscience des risques liés au changement climatique et à la Conférence des Parties (COP21) de Paris. En Belgique aussi, la question de la disponibilité de ce financement est un sujet important. Il s'agit en effet d'un facteur clé permettant la transition vers une économie bas carbone. Le gouvernement belge est particulièrement intéressé par les opportunités permettant de stimuler le financement d'initiatives à faible émission en carbone par le secteur privé. Un besoin de renforcement de capacité en matière de rapportage des flux de financement climat a en outre été identifié, de même qu'un besoin de mieux comprendre la complexité des méthodologies de suivi et des implications des différents choix méthodologiques à poser en élaborant celles-ci.

C'est dans ce contexte que la présente étude a été initiée. Son objectif est d'identifier les flux d'investissement relatifs à la lutte contre les changements climatiques en Belgique, et plus spécifiquement ceux liés aux activités d'atténuation, d'adaptation et aux services climatiques. Les flux identifiés peuvent soit être dirigés en priorité vers des objectifs climatiques (on les appelle alors '*climate-specific*'), soit faire partie d'un panel d'objectifs plus large (ils sont alors qualifiés de '*climate-related*').

Le principal produit de cette étude est le 'Diagramme des flux de financement climat belges', qui procure un aperçu de tous les flux de financement identifiés, représentant un total de 6,4 milliards d'euros de financement climat en Belgique pour l'année 2013. Les sources principales de ces investissements sont les entreprises (47%), les budgets publics, incluant les fonds européens (34%) et les ménages et PME (19%). Sur la part des budgets publics, 94 % sont des fonds publics belge et 6 % sont des fonds publics de l'Union européenne. Les principaux instruments financiers utilisés pour lutter contre le réchauffement climatique sont d'une part les capitaux (49%) et les prêts (16%), utilisés par les investisseurs du secteur privé et d'autre part les subventions (10%), les investissements publics (10%) et les mesures d'incitation (11%), utilisés par les entités publiques. La faible utilisation des prêts concessionnels en Belgique est une différence majeure par rapport par exemple à l'Allemagne (3% contre 44% en Allemagne) et peut être expliquée par le rôle limité des institutions financières publiques en Belgique.

5,4 milliards d'euros (84%) du financement de la lutte contre le réchauffement climatique sont utilisés à des fins d'atténuation du changement climatique, parmi lesquels on retrouve les investissements relatifs à l'efficacité énergétique, la réduction des gaz à effet de serre et la production d'énergie renouvelable. Ces flux d'investissement peuvent être répartis entre les secteurs suivants :

1. Production d'énergie et infrastructure de réseau (54%) : essentiellement des investissements dans la production d'énergie renouvelable et la cogénération (PCCE)
2. Industrie (4%) : essentiellement des investissements relatifs à l'efficacité énergétique.
3. Bâtiments (26%) : essentiellement des modernisations d'équipement afin de les rendre moins énergivores
4. Transport (15%) : essentiellement du transfert modal

5. Agriculture (1%) : essentiellement des investissements relatifs à l'efficacité énergétique et aux infrastructures bas carbone

Le reste du financement belge de la lutte contre le réchauffement climatique est utilisé pour les services climatiques (15%) et l'adaptation (1%). Les services climatiques concernent surtout les programmes nationaux de R&D ainsi que les services liés au climat financés par les entreprises, tels que la consultance, la gestion de l'énergie et la finance carbone. Dans le domaine de l'adaptation aux effets néfaste des changements climatiques, les investissements couverts sont les investissements publics en matière de gestion des eaux et de contrôle des inondations. Ce flux d'investissement devrait augmenter dans les années à venir, puisque les plans d'adaptation des différentes régions étaient en cours d'adoption dans le courant de 2013.

Outre les instruments de financement publics focalisés essentiellement sur l'amélioration du rendement des investissements bas carbone afin de les rendre rentables, plusieurs instruments visant à supprimer les autres barrières à l'investissement (instruments indirects) ont été identifiés. Les instruments indirects belges déjà en place comprennent les audits énergétiques, les schémas de certification et de standardisation, un cadre réglementaire pour les investissements à long-terme dans l'efficacité énergétique et l'énergie renouvelable, la réduction des risques ainsi que l'accès à la finance et aux prêts verts. En outre, plusieurs bonnes pratiques issues de différents Etats Membres de l'UE sont identifiées. Celles-ci incluent les contrats de performance énergétique, les prêts (préférentiels) et les obligations en matière d'économie d'énergie.

Certains défis sont apparus lors de la collecte des données relatives au financement climat, tels que le chevauchement entre les mesures fédérales et régionales qui ciblent les mêmes activités et acteurs. Il manque également un cadre général avec un système clair d'indicateurs pour assurer le suivi et le rapportage de la mise en œuvre des activités et le secteur privé n'est pas incité à faire remonter l'information sur ses investissements. Ces défis rendent difficile la possibilité d'avoir une vue claire sur le financement de la lutte contre le réchauffement climatique en Belgique. Il est par conséquent conseillé d'installer un registre central et un rapport annuel rationalisé compilant les mesures prises pour le climat à tous les niveaux (UE, fédéral, régional, local). Enfin, il est recommandé d'encourager les parties prenantes telles que les institutions (publiques) et les associations de secteur à rapporter de manière plus détaillée sur leurs résultats.

Plusieurs recommandations visant à stimuler les investissements bas-carbone privés ont été rédigées pour le gouvernement belge. Il est ainsi recommandé de continuer à soutenir le coût différentiel des mesures d'efficacité énergétique et de continuer à combiner l'aide publique et les programmes (volontaires) de réduction énergétique. Les investissements en transfert modal (par exemple dans le domaine ferroviaire) sont recommandés, particulièrement dans les régions où ils s'alignent sur les développements économiques régionaux. En matière d'énergie renouvelable, la principale recommandation est d'offrir un cadre réglementaire stable et prévisible. Des recommandations ont par ailleurs été rédigées afin de réduire le risque pour les investisseurs en technologies bas carbone et à encourager les institutions financières à devenir plus actives dans le financement de ce type d'activités. Enfin, de nouveaux modèles de financement tels que les associations coopératives et le 'crowd funding' devraient être stimulés.

1 Introduction

This study focuses on climate finance in a Belgian context. It is clear that besides the international agenda, there is also a strong national responsibility, as in order to realise the ambitious targets in terms of GHG emissions reduction in Belgium itself, it is of utmost importance to explore the understanding of private investments and the relation to public budgets. This report identifies the 'intra-Belgium' investment streams related to climate change projects and services (such as renewables, energy efficiency, transport, etc.) on the basis of a number of predetermined parameters (inspired by 'the German Climate Finance Diagram'). These investments are estimated per sector by 'uses' (such as the energy, buildings, industry, agriculture and transport sectors) for the reference year 2013 as the figures for 2014 were not yet available. The final result is a diagram showing the financial streams starting with the sources (European, federal or regional budgets, municipalities, private enterprises, citizens), then the intermediaries (ministries and agencies/funds, capital markets, public banks), the instruments used (financing via equity or debts, subsidies/grants via fiscal or financial measures, public loans), followed by the channels (agencies, banks, ESCOs) and finishing with the 'uses'.

We begin this chapter by briefly presenting the context, followed by explaining the different definitions (also referring to some annexes), ending with an explanation of the analytical framework.

1.1 Context

In line with the decisions taken at the conferences of Parties in Copenhagen and Cancún (the commitment to deliver long-term low carbon development strategies), the EU developed in 2011 a roadmap to 2050 for a low carbon economy. This roadmap indicates that (by 2050) the EU should reduce its CO2 emissions to 80% (below 1990 levels) through domestic reductions alone. A way forward to such a low-carbon society is to invest in clean technologies but, first of all, to design a clear scenario how this objective can be reached. The study 'Scenarios for a Low Carbon Belgium by 2050' or in other words 'how can we reduce our greenhouse gas emissions by 80 to 95% by 2050 (relative to 1990)?' is a starting point for answering the question 'what would be the cost to achieve these reduction levels'?

This study indicates that in order to reach these reductions an average yearly investment of €37 billion (up to 2050) is needed under the Core scenario (-80% GHG) and up to €44 billion under the -95% GHG scenario. An interesting fact is that the estimated investments for the Core scenario are only slightly higher than for the Reference or Business as Usual scenarios (€33 billion yearly or a difference of €4 billion annually). In addition, when looking at the total system costs of both scenarios (thus including costs for fuel and O&M), the Core scenario is actually more than €6 billion cheaper annually, due to highly reduced fuel costs. We could conclude from this that, from an investment point of view, it shouldn't be that difficult to achieve an 80% GHG reduction by 2050.

However, what the study does not indicate accurately, is that quite some large investments in energy efficiency, infrastructure, flexibility, renewable energy and interconnections under the Core (and other) scenarios have to be financed upfront and payback periods are long. In other words, we need investors who want to take the risk to invest in the short term in energy efficiency, renewables and infrastructure and to be compensated in the future by lower fuel expenses (fossil fuel savings). It is

clear that, especially in the current risk averse environment, finding the funding for these investments in the private market is the biggest barrier for a future low carbon society.

It is important to note that when this study began, the Belgian 'story' about private sector climate finance was nearly an empty page. There were no studies, articles or other material available about intra Belgian private climate investments. As such, it is very different from the number of articles and studies already written related to the Belgian commitments regarding international climate finance (see supra) or information available on public financial instruments/tools to reduce/save energy or invest in renewable energy technologies[1]. At the same time, it is important to mention that these intra-Belgian climate-relevant investments are not counted from an international perspective as 'climate finance' as they are not aimed at contributing to international climate finance for developing countries.

Given the above, there is a strong need to better understand and map the low-carbon investments made in Belgium by the private and public sector. Therefore, this study provides outputs and insights about the sources, instruments and uses for low-carbon investments in Belgium, and develops a reporting and mapping framework (that can be used for internal purposes later on) of 'climate finance' by Belgium at national level.

1.2 Definitions

1.2.1 Definition of climate activities

For our definition of climate activities, we initially fall back on the definition of the multilateral development banks that build upon three groups of activities: climate mitigation, climate adaptation and activities to support the implementation of climate policies (also referred to as 'climate services'). The definitions for climate mitigation, climate adaptation and climate services are mentioned at the start of the corresponding chapters. An exhaustive list of all potential climate mitigation activities is given in Annex 1. Annex 2 to Annex 8 show the climate activities we looked at from a Belgian perspective, taking into account the private and public climate activities. A difference with the MDB definition is that we will not only look at project-based investments but also at ongoing money flows (as certain figures for specific sectors are calculated from a more general approach). Another important difference is that we have grouped the climate mitigation activities differently, in a way that is more aligned with the CPI approach.

1.2.2 Defining the research boundaries

Our study – as requested by the client – will follow, as much as possible, the same methodology as was used for the cartography of climate finance in Germany by the Climate Policy Initiative (CPI). The cartography distinguishes the following types of investments:

1) Climate-specific versus climate-related investments: Climate-specific investment refers to capital flows that target investments resulting in climate change mitigation or avoidance of emissions (e.g. investing in renewable energy technologies)[2]. We foresee three climate-specific categories, namely renewable energy, energy efficiency, and non-energy related measures. Energy efficiency

[1] See also: http://www.klimaat.be/nl-be/dagelijkse-acties/inspanning/financiele-steun.
[2] See Corfee-Morlot et al. (2009) or Buchner et al. (2011).

measures include investments into facilities (including buildings), production lines, and technologies leading to an increase of useful energy output over energy input. Non-energy related measures include other process- and production-related investments that help reduce direct emissions (e.g. in industry, or by removal of carbon from the atmosphere through afforestation). In turn, we will define climate-related investments as those financial flows that 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 (e.g. renovation of buildings, agri-environmental measures and investments in railways). The way we have dealt with this distinction per sector, is explained in the annexes. Climate adaptation activities are by definition not climate specific. We haven't made a distinction between climate-specific and climate-related for the climate services.

2) Incremental versus capital investments: Incremental investments are those necessary to cover the difference between the more carbon-intensive baseline option and a less carbon-intensive option (GEF 2010). While for energy efficiency and non-energy-related emission reduction measures it may be possible to track incremental investments in climate-specific assets (or alternatively calculating them based on assumptions), calculating the incremental cost for renewable energy investments is challenging. Therefore, we will track renewable energy investments at their total capital cost. The consequence is that a direct comparison of investment volumes among different climate-specific categories is not possible. The way we have dealt with this distinction per sector, is explained in the annexes. Climate adaptation activities are by definition incremental investments. We haven't made a distinction between incremental and capital-investments for the climate services.

3) Tangible investments: The cartography of CPI only includes tangible investment flows such as investment in physical assets like machinery, equipment, or buildings. However, this study is also including - as much as possible - intangible investments such as research and development, information, training, or capacity building. In addition, we will track only primary investment[3] flows, or investments that led to the creation of new or additional assets for mitigation purposes.

Besides the division in specific types of investments, we will also divide the climate activities in specific categories (cf. our definition), such as mitigation (basically renewable energy activities (RES) and energy efficiency activities (EE)), adaptation and services. The difference here with the CPI study is that we also include climate adaptation activities, climate related services and funding for climate activities that came from EU funding programmes (which will be part of the overall public investments).

The next step is to split the mitigation activities into five sectors: Energy generation and infrastructure, industry, buildings, transport and agriculture.
The above is explained in Table 1.

[3] By primary investment we understand investments that do not take into account the cost of capital incurred by the investors (and as such do not reflect the cost of capital or debt repayment). We have taken into account only the real flows, which means only those financial flows which were spent in assets (and thus passed the financial closure).

Table 1: Climate finance boundaries

	Climate-specific investments		Climate-related investments	
	Incremental cost	Capital investment	Incremental cost	Capital investment
Tangible	Energy efficiency, non-energy related reduction measures	Renewable energy	Measures that deliver co-benefits in terms of emission reduction e.g. renovation of buildings, agri-environmental measures, investment in transport modal shift (thus for ex by investing in railways), etc.	
Intangible	R&D, information policies, training, and capacity building			

In the CPI study, intangible investments and climate related investments are not taken into account in the climate finance diagram. We will take them as much as we can into account. As already indicated, the CPI study does not take into account climate adaptation. We will cover adaptation by focusing on public investment programs. The CPI study only looked at primary investment flows, or investments that led to the creation of new or additional assets for mitigation purposes or (supplementary in our study) for adaptation or R&D purposes that could lead to increased mitigation or adaptation. We propose to do the same. Also in line with the methodology of CPI, we will not quantify the role of government guarantees provided to public banks and the grant-equivalent value of concessionary loans (as we do not have the necessary information to do so). However, we will take into account concessionary loans given by for example the EIB to Belgian climate specific or related projects. An important distinction with Germany is that Belgium doesn't have a public financial institution like KfW and as such the role of public banks in the Belgian constellation will be much lower.

1.3 Analytical Framework

1.3.1 Sources, Intermediaries, instruments, channels and uses

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 public sources (Belgian and EU) and private sources. Public finance covers EU Funds, national and regional governments and municipalities. Private sources can be split into corporates and households.

Intermediaries include the governmental bodies like ministries and government agencies, the public banks and the capital markets (different types of financial institutions). Their role is to facilitate the provision of finance from its initial sources to its uses, offering different financial instruments. As intermediaries, they may play the role of public or private financial administrators, finance lenders, contributors of expertise, or provide other services.

Instruments include grants, concessionary loans, risk management, equity, debt instruments such as commercial loans or bonds, and Kyoto Protocol (KP) mechanisms. They represent the different financial means of supporting climate-specific projects and measures.

Disbursement channels (institutions that specialize in disbursement of finance) play a less prominent role in Belgium 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 the sectors or people receiving at the end the climate finance. We grouped them into three categories: mitigation, adaptation and services. The climate mitigation activities are further split up into energy (including generation and infrastructure), industry, buildings, transport and agriculture.

1.3.2 Data

Data gathering[4]

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 anexes. Depending on the structure of the specific sector or type of climate activity, we used either a detailed bottom-up approach (compiling data from the company, project, or technology level), or a top-down approach (using aggregate statistics and reports). We applied both approaches in the industry, buildings, transport, and agriculture sectors and for the adaptation activities. In the energy generation and infrastructure sector, we primarily used the aggregation approach. For most of the climate services, we fall back on an existing database.

Data analysis/limitations/assumptions

One of the most important precautions when using data from various points along the finance flow was to avoid double counting (e.g. from Belgian 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.
To determine the climate-specific or related share of broader budget lines and their allocation to any of the climate-specific categories, we referred to expert opinion or other qualitative information.

An important remark is that 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. 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. Additionally,

[4] The information obtained and the information contained in our report will not be audited and/or reviewed in accordance with the International Framework for Assurance Engagements. Our report does not qualify as an assurance engagement or assurance related engagement.

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. Finally, we also faced issues with the collection of data from the regions which led to a lack of information of the disbursement of the Public actors in the Walloon and Brussels regions. This is explained in detail in the different annexes.

MIXED REPORTING YEARS

We had the choice to use only 2012 data or report 2013 data for a significant part of the study. We selected the latter option in order to highlight the most current trends in financing despite reporting delays in some areas. Where flows span several years, we annualized them to make them compatible with other data sources.

2 The Belgian climate activities

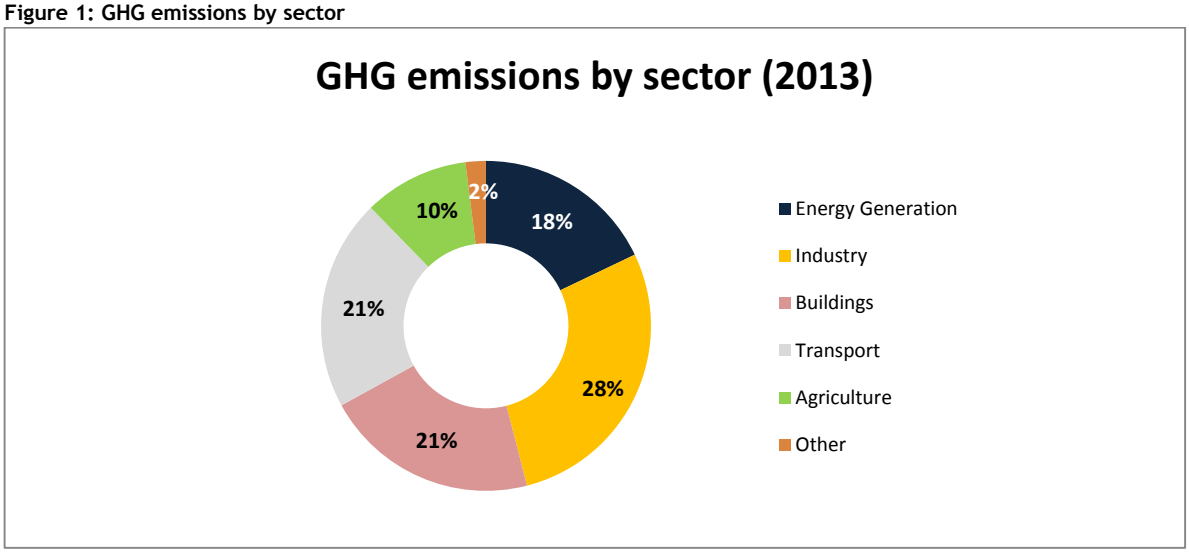
In this chapter we will provide an overview of the Belgian climate activities and their corresponding financing flows. As explained in the methodology chapter, the climate activities are divided into the following three categories: Mitigation, adaptation and services. The total financing flow for those three categories adds up to **EUR 6,5 billion** for the reference year 2013, with the major share coming from climate mitigation activities: **EUR 5,4 billion**. The adaptation and services categories contribute to **EUR 45 million** and **EUR 1,0 billion** respectively (plus some outflow related to carbon offset).
In the following sections we describe the background, methodology and detailed findings per category (mitigation, adaptation and services).

2.1 Climate mitigation

An extensive list of climate mitigation activities is given in Annex 1. Under this study we focus on the mitigation activities in the energy, industry, buildings, transport and agro-sector. These sectors (and which activities are included) are explained in detail in Annexes 2 to 6.

Those five sectors are responsible for 98% of the Belgian GHG emissions (see figure 1 below). As a consequence, they are the main recipients of climate mitigation financing. In the next paragraphs we will discuss the background, methodology and findings for each of those sectors.

Figure 1: GHG emissions by sector



2.1.1 Energy generation and grid infrastructure sector

SECTOR BACKGROUND

In 2013, the energy sector was responsible for 17,9% of the total greenhouse gas emissions in Belgium compared to 20,9% in 1990[5]. The large grid connected fossil fuel fired installations for electricity and heat generation were responsible for the majority of the total sector emissions (78%); oil refineries and generation of solid fuels represented 21% and 1% respectively. Notwithstanding a substantial increase of the output of the grid connected electricity and heat generation installations between 1990 and 2013

[5] Climate.be. (n.d.). *De bijdrage van de belangrijkste sectoren in de totale uitstoot en hun evolutie*. Retrieved from http://www.klimaat.be/nl-be/klimaatverandering/belgie/belgische-uitstoot/belangrijkste-sectoren-de-totale-uitstoot

(+35%), the related GHG emissions have significantly decreased (-32%), thanks to technological improvements, replacement of conventional power/heat generation installations with highly efficient combined heat and power installations (CHP), replacement of coal fired power plants with gas fueled power plants (CCGTs: Combined Cycle Gas Turbines), and last but not least, the massive deployment of renewable energy sources.

Sector Methodology

Low carbon related investments in the energy sector are mainly related to electricity and heat generation assets on the one hand and electricity and gas grid infrastructure on the other. Some technologies, in particular for the generation of electricity, heat and biofuels from renewable energy sources, are considered as climate specific, as these technologies are mainly implemented in order to reach climate objectives. Carbon Capture and Storage (CCS) is also climate specific; however we will not consider this technology further in this study as the involvement in CCS of the Belgian public and private sector is very limited: there are no concrete demonstration or industrial projects in Belgium, but only a limited involvement in some R&D projects.
Most other low carbon investments and technologies, in particular Combined Heat and Power and grid investments are climate related as they also substantially contribute to other objectives, in particular energy efficiency and security of supply (reduction of energy import and fossil fuels dependency) and competitiveness of the economy. Nuclear is a typical low carbon technology but out of the scope of this study [6].

Efficiency improvements in grid connected fossil fuel fired electricity and heat generation assets are mainly realized via investments in combined heat and power installations. Due to the consequences of the transition to a low carbon energy supply, in the reference year 2013 there were no other major investments in the conventional power generation area. Conventional power generation is indeed under pressure and several power plants have recently been decommissioned, or are only used as strategic reserves. This chapter will hence focus on investments and maintenance costs in 2013 for renewable energy and combined heat and power (CHP) generation.

The climate relevant grid investments mainly consist of transmission and distribution electricity and gas grid extensions and reinforcements which are necessary to connect new end-users and RES and CHP installations on the one hand and investments in related infrastructure and appliances (smart metering, communication systems, etc.) to enable energy efficiency on the other hand.

After having gathered all relevant investment related data in the energy sector and having determined the methodology to consider them as climate-specific or climate-related, the available information was broken down into areas corresponding to the framework for the overall landscape. We identified sources, and end-uses, intermediaries and instruments.

Separate figures are in the relevant overviews mentioned for the following subcategories:

- Renewable energy generation (RES): a distinction is made between
  - generation of electricity based on RES (RES-E): wind onshore, wind offshore, photovoltaics, hydro, biomass, biogas

[6] Nuclear is a specific low carbon technology, but investments in nuclear technology are in most similar climate studies (e.g. CPI-study for Germany) not taken into account.

  - generation of heating energy based on RES (RES-H): the considered technologies are heat pumps and thermal solar; district heating grids have also been considered but the related investments are (still) very limited
  - generation of biofuels (biodiesel and bioethanol) used in the transport sector (RES-T)[7]
- Combined heat and power installations (CHP)
- Investments in electricity and gas grid transmission and distribution infrastructure that contribute to reduce GHG emissions

As for RES-E and CHP the same policy instruments (green certificates) are used we will treat them together in the summary on "sector findings" (which is also explained in Annex 2).

Sector Findings

Power generation based on renewable energy (RES-E) and combined heat and power (CHP)

In order to stimulate investments in low carbon power generation capacity, the federal and regional authorities have implemented a system of **green certificates**, which are allocated to power and heat produced from renewable sources or in qualitative (offering substantial primary energy savings compared to conventional generation) combined heat and power (CHP) installations. Power generators can sell their green certificates at market price to electricity suppliers, either bilaterally or via a dedicated exchange platform, or at a regulated minimum price to the grid operator (TSO or DSO depending on the technology and connection point). Electricity suppliers must submit green/CHP certificates to the regulator on a yearly basis to meet their quota obligations. They are required to have a minimum share (yearly increasing percentage) of their supplied electricity produced from renewables and/or CHP. If they do not respect these quota obligations a penalty is due.

The certificate schemes are slightly different depending on the political level and technology:

- At federal level the national regulator CREG is responsible for granting green certificates to offshore wind producers. These certificates are not tradable but can only be sold to the TSO at a regulated price.
- In Flanders separate green certificates are granted to power production from renewables and to low carbon power generated in CHP installations. Electricity suppliers have 2 separate quota obligations, first one for power supply from renewables and a second one for power from CHP installations.
- Wallonia and Brussels have an integrated green certificate scheme that covers both renewables and CHP. Electricity suppliers have only one single quota obligation, and green certificates are in principle mutually recognized by the 2 regions.

In addition to the green certificate schemes, there are some other specific measures to stimulate the development of RES-E:

- Offshore wind generation: reserved zones for offshore wind parks, subsidy for connection cost (cable), more favorable rules for imbalances
- Investments in renewables are incentivized via a corporate tax reduction (13.5 % one-off tax deduction)

[7] The specific investments related to the development of electric vehicles and the use of natural gas (CNG and LNG) for transport purposes are not included in this chapter but in the chapter on the transport sector.

RES-E AT FEDERAL LEVEL: OFFSHORE WIND ENERGY INSTALLATIONS

In July 2015, a total generation capacity of 712,2 MW was operational and connected to the electricity grid. The first 3 concessions which are currently being built will represent a total capacity of 871 MW (Belwind 330 MW, Northwind 216 MW and C-Power 325 MW). The federal authorities have granted concessions for 5 other wind parks which should in principle be built by 2020 and would represent an additional capacity of about 1.315 MW.

As it is difficult to exactly identify the individual investments in a specific year, we have estimated them for the reference year 2013 on the basis of the average duration of the construction period and the capacity commissioned in 2013-2014. The 3rd phase of C-Power (48 x 6,15 MW) has been commissioned in July 2013 as well as part of the Northwind project (47 x 3 MW) and 1 demonstration turbine (Alstom 6 MW) in the first half of 2014. On the basis of this information we estimate that in the reference year 2013 the equivalent of 160 MW has been invested, which equals a total **investment of EUR 608 million** taking into account an investment cost of EUR 3.800/kW (see CREG studies 1061 of 27 October 2011 and 1258 of 26 June 2013).

In general, the investments are financed by mainly **private equity capital (20% to 30%) and loans (70% to 80%)**, granted by a consortium of financial institutes. Phase 1 of Belwind (EUR 614 million for 165 MW) has e.g. been financed by equity capital (20,5 %) from mainly private shareholders (Colruyt Group, Dahm, Meewind, PMV and Rabo investments) and a loan (79,5%) granted by a consortium managed by Belfius (senior) and Rabo Bank (mezzanine), and consisting of EIB, EKF, ASN, Belfius and Rabo. For other projects, e.g. Northwind, 30% of the investment is equity financed; this ratio (30% equity and 70% loan) is considered as the general rule for offshore wind investments (see study CREG 1258 of 26 June 2013).

The maintenance costs of offshore wind turbines can also be considered as climate specific expenses. In 2013 these costs were approximately **EUR 40 million** (capacity operational on 31.12.2012 = 380 MW - load factor of 3500 h/a - maintenance cost = EUR 30/MWh, according to the CREG report 1258 of 26.06.2013).

For the connection of the offshore wind parks, Elia has to reinforce and extend its grid infrastructure; specific investments in 2013 will be referred to in the chapter on electricity grid investments.

RES-E AND CHP IN FLANDERS

Investments in renewables in Flanders were very cyclical from 2009-2014, mainly due to the support scheme which was not adapted in time to take into account the decreasing cost of PV installations: in the top year 2011 a total of 84.599 new RES-E installations (of which 84.566 PV) were commissioned versus only 4.110 in 2013 (of which 4.081 PV). In 2009-2012 about 52.900 new RES-E installations were on average commissioned per year versus only 5.160 in 2013-2014. The investments that are included in this study (estimations for the reference year 2013) are hence substantially lower than the peak values in 2009-2012.

As detailed information about the yearly investments in renewables and CHP is not available, we have estimated them for the reference year 2013 on the basis of the new capacity which was commissioned in 2013 and 2014. These data are reliable and available for each technology, as they are validated and used by the regulator VREG as a basis for granting green certificates. We have used the assumption that the investments related to the capacity commissioned in year 'x' have been realized in year x (50%) and year x+1 (50%). The investment estimates for 2013 are hence based on 50% of the capacity commissioned in 2013 + 50 % of the capacity commissioned in 2014. Investment projects for RES have a lead time of several years (due to feasibility studies, permitting, etc.), but the technical investments that represent the major part of a project, typically take place during the 12 months before the commissioning date.

The **total value, EUR 220 million in 2013,** is estimated by taking into account the standard investment cost per technology which is determined by VEA yearly ("Onrendabele topberekening"); the financing modus (share equity capital versus loan financing) is also based on the assumptions used in these official reports published by VEA.
The maintenance cost estimation for 2013 of the RES installations amounts to EUR **399 million** and is based on the capacity installed on 31.12.2012 and taking into account the average annual maintenance cost per technology.
New or refurbished **CHP installations** that allow to substantially reduce the primary energy consumption compared to conventional power/heat generation are in Flanders eligible for specific CHP certificates. The **CHP investments** estimated with the methodology as described above, amount to **EUR 39 million** and the **maintenance cost** amount to **EUR 181million** in 2013.

RES-E AND CHP IN WALLONIA[8]

Investments in renewables in Wallonia have also been very cyclical, mainly due to changes in the support scheme for PV: in the top year 2012 about 48.000 new PV installations were commissioned versus only 807 and 21.400 in respectively 2014 and 2013. The unclear regulatory framework for wind energy has also led to a substantial decrease in investments in wind energy: in 2011 about 92,4 MW new capacity was commissioned versus only 15,6MW and 36,5MW in 2014 and 2013 respectively. The investments that are included in this study (estimations for the reference year 2013) are hence substantially lower than the peak values in 2011-2012.
The **investments in green electricity** (RES and CHP) estimated with the methodology as described above, amount to **EUR 362 million** and the **maintenance cost** amount to **EUR 268 million** in 2013.

RES-E AND CHP IN BRUSSELS

Due to its geographical situation the RES potential in Brussels is very limited. In 2013-2014 there were no new large scale RES or CHP installations connected to the grid, and only 440 and 126 small scale PV installations in 2013 and 2014 respectively and 16 CHP motors.
The **investments in green electricity** (RES and CHP) estimated with the methodology as described above, amount to EUR **21 million** and the **maintenance cost** amount to **EUR 9 million** in 2013.

RENEWABLE ENERGY BASED INSTALLATIONS FOR HEATING AND COOLING (RES-H)

Similar to the policy to develop RES-E, the promotion of RES-H is foremost a regional competence. Accounting for the different policy frameworks, the following support schemes are in place in the regions for the production of heat from renewable energy sources:

- Brussels-Capital Region: premium schemes for households; investment aid for companies
- Flanders: certificates for CHP; premium schemes for households; investment aid via tenders for companies
- Wallonia: premium schemes for households; investment aid for companies

The federal level also promotes the use of heat production from renewable energy sources via two fiscal measures: income tax reduction for individuals and corporate tax deduction on investment costs for companies.

[8] For the Brussels and Walloon regions investments in RES-E and CHP are not presented separately as their support schemes cover both technologies and some investments e.g. biomass based CHP, cannot be split.

The investments in 2013 for the main RES based non CHP technologies for heating and cooling, namely **heat pumps and solar thermal installations**, are estimated on the basis of figures published by VITO and Apere[9]: they amount to **EUR 459 million.**

Most large scale RES based investments for heating and cooling (biogas, liquid and solid biomass, waste incineration) are CHP installations that also generate electricity; these investments are included in the previous chapter.

Some dedicated heating installations are however not eligible for green or CHP certificates; the Flemish government has therefore decided in 2013 to grant via a tendering scheme investment support to 3 categories of installations:

- Green heat installations with a capacity > 1 MWth
- Installations for the recovery of residual heat
- Installations for the production and injection of bio-methane in the natural gas grid

The first tender was launched in December 2013 with a budget of EUR 7 million (45% green heat, 45% recovery of residual heat and 10% injection of bio-methane). As these investments have been realized as of 2014, they are not taken into consideration for this study.

Investments in **district heating grids** can also be considered as climate specific or related. This technology was in general not well developed in Belgium, but the new economic and political context makes this type of technology more attractive. Several new district heating projects have indeed been launched since 2010[10]. The investments in heating networks were very limited in 2013 (maximum EUR 10 million) and detailed figures are not available. Therefore, these investments are not included in the quantitative overview.

RENEWABLE ENERGY BASED INSTALLATIONS FOR TRANSPORT (RES-T)

The promotion of the use of renewable energy sources for transport purposes (RES-T) is mainly a federal competence. The main support scheme for RES-T is a quota system for biofuels. This scheme obliges companies that import or produce petrol, gas or diesel fuels to ensure that biofuels make up a defined percentage of their total annual fuel sales in Belgium. Furthermore, biofuels are supported through tax regulations.

Seven companies are allowed by the Belgian authorities to produce predefined volumes of biofuel that were eligible for excise exemption until 30 September 2014:

- biodiesel: Bioro (Ghent), Néochim (Feluy), Oléon (Ghent) and Proviron (Oostende)
- bio-ethanol: Alco Bio Fuel (Gent), Biowanze (Wanze) en Syral (Tate & Lyle) (Aalst)

The specific investments for manufacturing and distributing biofuels between 2006 and 2015 amount to EUR 200 million for biodiesel and EUR 450 million for bioethanol. The investment are assumed to be spread equally over the different years, amounting to a total investment of **EUR 65 million** in 2013.

[9] Apere stands for 'Association pour la Promotion des Energies Renouvelables'

[10] Roeselare (the intermunicipality Mirom is extending its heat grid in order to supply heat from waste incineration to 91 houses and apartments); Kortrijk (a district heating grid is installed which will distribute the thermal energy from a biomass (wood chips) plant and a small CHP); Antwerp (a new heating network (16 Mio € investment) will be built and operated by a consortium with Iveg, water-link, Dalkia and Indaver); St Vith (a new district heating network (560 m) has been built to supply heat generated from local wood to public buildings (sports center with swimming pool, 3 schools and the town hall); Manhay (a district heating project is in operation since February 2014. It consists of a collective boiler fired with wood chips and a network (approx. 1500 m) which distributes thermal energy to abt 40 homes and buildings).

ELECTRICITY AND GAS TRANSMISSION AND DISTRIBUTION INFRASTRUCTURE

Electricity grids

The development of decentralized electricity generation, mainly CHP and solar and wind energy, have led to major changes in the design and operation of both transmission and distribution grids. The grids were initially designed to uni-directionally transport electricity from a limited number of large scale power plants to the end users, and are now being extended and upgraded in order to be able to connect the numerous new generating installations and to operate bi-directionally.

The investments in grid infrastructure and related assets include in particular communication networks and devices, systems for data and distribution management, and smart meters. Those investments are needed to monitor and steer both the load and the injection and to facilitate energy efficiency, demand response and the use of electric vehicles.

The share of the overall electricity grid investments in 2013 that can be considered as climate-related amounts to **EUR 28 million at transmission level** (Elia) and **EUR 114 million at distribution level** (based on figures provided by Eandis, Sibelga, Infrax and Ores).

Natural gas grids

The use of natural gas instead of other fossil fuels contributes to the energy and climate objectives, as its carbon content is lower and its use allows to reach high energy efficiency levels. The extension of the gas distribution grid in order to enable a maximum of households to connect to it, was for that reason considered a political priority, in particular in Flanders. Investments in gas grid infrastructure were also necessary to connect new professional end users, e.g. CHP installations and to ensure the availability of sufficient capacity to allow a diversified and secure supply from different sources. Finally, some climate related investments were realized in related infrastructure (e.g. compressor stations).

In the future the gas grid might be used to transport biogas from local producers (e.g. farms) to heat consumers; a pilot project has been set up in 2013 by Eandis.

The overall climate related investments of the gas grid sector for 2013 are estimated at EUR 8 million at transportation level (Fluxys) and EUR 72 million at distribution level.

2.1.2 *Industry sector*

SECTOR BACKGROUND

In 2013 the industry sector was responsible for 28,1 % of the total greenhouse gas emissions in Belgium[11] and for 30% of the total energy consumption[12].

Belgium hosts a variety of industrial activities, including refineries, production of steel, cement, lime, glass, chemicals and pharmaceuticals, pulp and paper, food processing, heavy machinery, non-ferrous metals and ceramics.

The main challenge for Belgian climate policy will be to mitigate the total GHG emissions. This means not only reducing the GHG emissions from existing industrial production but also developing new low-carbon industrial activities. As the industry sector plays a vital role in the Belgian economy, GHG-reduction efforts cannot be seen separately from industrial activities and thus should not inhibit the overall support of industrial activities[13].

[11] Climate.be. (n.d.). *De bijdrage van de belangrijkste sectoren in de totale uitstoot en hun evolutie*. Retrieved from: http://www.klimaat.be/nl-be/klimaatverandering/belgie/belgische-uitstoot/belangrijkste-sectoren-de-totale-uitstoot
[12] Eurostat. (2015). *Energy balance sheets - 2013 data*. Retrieved from: http://ec.europa.eu/eurostat/documents/3217494/6898731/KS-EN-15-001-EN-N.pdf/e5851c73-9259-462e-befc-6d037dc8216a
[13] Climact-Vito. (2013). *Scenarios for a Low Carbon Belgium by 2050*. Retrieved from: http://www.klimaat.be/2050/files/2513/8625/2687/Low_Carbon_Scenarios_for_BE_2050_-_Final_Report.pdf

Various technical measures have been identified for reducing GHG emissions in the industry sector:

- Energy Efficiency measures
- Process improvements
- Fuel switching
- Application of carbon capture storage (CCS)

The European emission trading system (ETS) and the carbon price will also continue to be a major driver towards low carbon solutions for industry.

Sector Methodology

In gathering the data and determining the methodology to identify climate-specific -and related investment in the industry sector, the information was broken down into areas corresponding to the framework for the overall landscape. We identified sources and end-uses, intermediaries and instruments. The climate finance activities of the industry sector are defined according to the typology of mitigation activities (see Annex 1):

- Industrial energy efficiency improvements through the installation of more efficient equipment, changes in processes, reduction of heat losses and/or increased waste heat recovery (category 1.4.1)

Installation of cogeneration plants (category 1.4.2) is not considered in the scope of the industrial sector. We refer to the chapter 'energy generation and infrastructure' for these activities.
Policy incentives for emission reduction in the industry sector offered via price instruments are taken into account, such as the outflow of carbon offset finance to the EU ETS. Next to the European incentives (government EU ETS revenues), also regional grants encouraging the achievement of energy efficiency improvements are considered in the financial analysis.

Sector Findings

In the next paragraphs we will detail the evaluation of the climate finance activities in the industry sector. For a summary of the assumptions and calculations made to analyze the tracked climate finance activities in the industry sector, we refer to Annex 3.

Industrial energy efficiency improvements, incl. process-related efficiency improvements [14]

In the analysis of energy efficiency in the industry, we tracked on one hand **the energy efficiency projects promoted by grants of the regional government** and on the other hand energy efficiency **projects leveraged by Energy Policy agreements with the energy-intensive industry**.

In the Flemish region energy efficiency projects are supported with grants. The **Enterprise Flanders distributes** these grants as part of the policy framework to support 'new industrial entrepreneurship'. Since 2011-2012, various project calls were launched regarding the new industrial entrepreneurship framework. Some of these projects are expressly related to the subject of energy and contribute to the development of new approaches to increased energy efficiency. The Flemish Government also decided to **grant a regional 'ecology aid' to enterprises for ecology investments (since 2010)** and to grant aid to enterprises for **strategic ecology investments** in the Flemish Region (since 2012). This resulted in the **Ecology Grant Plus and Strategic Ecology Grant**. The Flemish government aims to use this ecology aid to encourage enterprises to organise their production process more energy efficiently by supporting

[14] Flemish Government (2014). *Third Flemish Energy Efficiency Action Plan.* Retrieved from: https://ec.europa.eu/energy/sites/ener/files/documents/Flemish%20NEEAP_en_0.pdf

a part of the additional cost of energy efficiency investments. The supported investments with the Ecology Grant Plus are mostly related to energy efficient technologies and energy recuperation, based on a predetermined list of 'limitative technologies' while the Strategic Ecology Grant supports strategically important energy efficiency investments related to material cycles and process-integrated solutions. In 2013, the **Flemish government** granted **EUR 16 million ecology aid to industrial corporations, leveraging** almost **EUR 151 million private investments in energy efficiency measures, energy recuperation and energy efficient process improvements**

Besides the financial support of Energy Efficiency measures, the Walloon and Flemish government also leverages energy saving initiatives by industrial companies through **Energy Policy Sector agreements** with the energy-intensive industry.

In Flanders two separate sector agreements were established with the energy-intensive industry, related to primary energy consumption. Flemish energy-intensive companies with an annual primary energy consumption of at least 0,1 PJ and less than 0,5 PJ (excluding TEP companies) could (voluntarily) participate in the Audit Covenant. Flemish companies with a yearly primary energy consumption higher than 0,5 PJ (plus TEP companies) could join the Benchmark Covenant. The participating companies of both sector agreements are encouraged to reduce their energy use by drafting an energy plan and are obligated to implement every economically viable investment (IRR after tax of at least 15%). These companies need to report annually on both energy savings and implementation of investments, although not every company reported the actual investments. These reports are verified by the Flemish Benchmark Verification Office (VBBV).. For the Audit Covenant, the estimated total investment amounts to **EUR 24 million**, resulting in 684 TJp energy savings or an annual 2% reduction of the total energy consumption compared to 2005. No information about investments is available to estimate the leveraged investments by the Benchmark Covenant.

Also **in Wallonia, a sectorial agreement is established with the energy-intensive industry. The Wallonia Public Service** (SPW - DGO4) is responsible for the policy framework **of the 'Accords de Branche', first and second generation.** At the end of the first generation of Accords De Branche in 2013, 155 companies were voluntarily participating, leveraging a total primary energy reduction of 15.447.953 GJp over a period of 9 years (2005-2013). The investments in 2013 for energy efficiency improvements (incl. energy efficient process improvements) amount to **EUR 76 million**.

The total investments in energy efficiency improvements in the industry sector is estimated to be **EUR 243 million**. For the Flemish Region, only the investments related to the Flemish Ecology Grant Plus and Strategic Ecology Grant are included. Investments related to the Audit or Benchmark Covenant are considered to be covered by the Ecology grants (in fact, companies eligible to the covenants are obliged to participate if they want Ecology support). For the Walloon region, only the investments made in the context of the branch agreements are considered. The companies participating under the Accords de Branche programme are responsible for 85% of the total energy consumption in the Walloon region. Although not all of the Walloon industry is covered within the investments implemented (and reported) within the Accords de Branche programme[15], the assumption is made that is representative for the whole Walloon region as no other programmes or supporting measures are identified, leveraging energy efficiency investments.

[15] This is in contrast to the scope of the Flemish region, in which the whole industry is covered by the Flemish Ecology grant Plus and Strategic Ecology Grant.

Government revenues and carbon offset expenses by EU ETS companies and public entities

The EU emissions trading system (EU ETS) is a cornerstone of the European Union's policy to combat climate change and its key tool for reducing industrial greenhouse gas emissions cost-effectively. The EU ETS works on the 'cap and trade' principle. A 'cap', or limit, is set on the total amount of certain greenhouse gases that can be emitted by the factories, power plants and other installations in the system. The cap is reduced over time so that total emissions fall. Within the cap, companies receive or buy emission allowances which they can trade with one another as needed. They can also buy limited amounts of international credits from emission-saving projects around the world. After each year a company must surrender enough allowances to cover all its emissions, otherwise heavy fines are imposed. For reporting year 2013 the total amount of corporate carbon offset financing is **EUR 34 million**, based on the difference between the free and surrendered allowances by the Belgian EU ETS companies in 2013 (reported by the national registry for greenhouse gasses). The Flemish, Walloon and Brussels government also bought CO_2-emmission rights on the market. The estimated total cost of public carbon offset financing amount **EUR 26 million**[16]**.**

Since 2013, a share of the annual national emission rights of each EU member state are auctioned on the European Energy Exchange (EEX) auction platform[17]. Bidding entities are mostly (industrial) companies, financial institutions and investors. In 2013, Belgium auctioned 26 million emission rights, resulting in a total national revenue **of EUR 115 million**. The FPS Health, Food chain safety and Environment (department Climate change) has been appointed as auctioneer by the National Climate commission. In anticipation of an intra-Belgian agreement of the distribution of the benefits and expenses of the European Energy and Climate package between the three regions, the EU ETS revenues are blocked[18]. In Flanders, the EU ETS revenues will be used to finance the 'Klimaatfonds' (climate fund) which will be used to support different climate-related measures. In 2013, the 'Klimaatfonds' received **EUR 36,5 M million**, originating from the revenues of the auction of the remaining allowances of the new entrants reserve of the trading period 2008-2012[19]. Thus, the total public revenues from the EU ETS auction are **EUR 151,5 million**.

Carbon Capture & Storage and Fuel Switching

Other climate-related investments in the industry sector are **Carbon Capture and Storage** (CCS) and **fuel-switching**.

Carbon Capture and Storage is the process of capturing and compressing the CO_2 produced on industrial sites and injecting it in a suitable geological formation. The implementation report of 2014 of the European Commission CCS Directive (2009/31/EG)[20] indicates that most countries (including Belgium) have brought into force the laws, regulations and administrative provisions necessary to comply with the Directive. In 2013, the CCS-activities in Belgium are related to the readiness phase (EU FP7 study projects, see Climate Services) rather than the actual implementation. As discussed in chapter 3.1.1. Energy Generation and grid infrastructure sector, investments in CCS are not included for 2013.

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[17] European Commission. (n.d.). *The EU Emission Trading System (EU ETS) - Auctioning*. Retrieved from: http://ec.europa.eu/clima/policies/ets/cap/auctioning/index_en.htm

[18] Eyckmans, J. (2013). *België veilt 26 miljoen emissierechten in 2013*. Retrieved from: http://www.presscenter.org/nl/pressrelease/20130107/belgie-veilt-26-miljoen-emissierechten-in-2013

[19] Flemish Government. (2013). *Het Vlaams Klimaatbeleidsplan 2013-2020*. Retrieved from: http://www.lne.be/themas/klimaatverandering/klimaattips/klimaattips/wat-doet-de-vlaamse-overheid/vlaams-klimaatbeleidsplan

[20] European Commission. (2014). *Report from the commission to the European parliament and the council on the implementation of Directive 2009/31/EC on the geological storage of carbon dioxide*. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0099&from=EN

Fuel Switching is the process of replacing inefficient fuels with a cleaner and less polluting alternative (e.g. coal to natural gas switching). Although investments in Fuel Switching are not identified individually in this study, they included in the scope indirectly as they are a port of the investments in CHP, investments in CO_2-emmission reduction leveraged within the Industrial sectorial agreements and the investments in energy reduction measures supported by the (Strategic) Ecology Grant.

2.1.3 *Buildings sector*

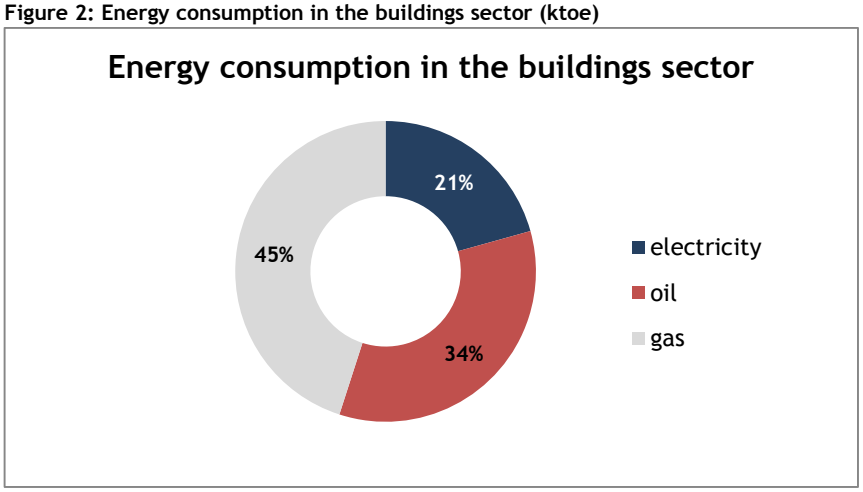
SECTOR BACKGROUND

In 2013 the building sector (residential and commercial) was responsible for 21% of the total greenhouse gas emissions in Belgium[21] and 26% of the total energy consumption. More detailed information shows that the residential sector was responsible for 37% of the overall natural gas consumption, 20% of the oil consumption for heating and 24% of the overall electricity consumption[22].

The residential sector is also a very important consumer of renewable energy, which is related to the large share of residential solar PV installations, which results from the highly generous government policies (e.g. renewable energy certificates and tax reduction) in the past.

Energy consumption reduction potential in the buildings sector exists mainly in space heating and electricity consumption. Space heating is responsible for almost 80% of total energy consumption, while electricity consumption contributes to approximately 20%. Possible measures that can reduce emissions significantly are: district heating based on renewable energy or thermal energy recovered from industrial processes (limited economically feasible potential in Belgium), energy efficient retrofitting (renovations), energy efficient new construction and stimulation of energy efficient appliances, electronics and ICT equipment.

Figure 2: Energy consumption in the buildings sector (ktoe)



[21] Climate.be. (n.d.). *De bijdrage van de belangrijkste sectoren in de totale uitstoot en hun evolutie*. Retrieved from: http://www.klimaat.be/nl-be/klimaatverandering/belgie/belgische-uitstoot/belangrijkste-sectoren-de-totale-uitstoot
[22] Eurostat. (2015). *Energy balance sheets - 2013 data*. Retrieved from: http://ec.europa.eu/eurostat/documents/3217494/6898731/KS-EN-15-001-EN-N.pdf/e5851c73-9259-462e-befc-6d037dc8216a

Sector Methodology

After having gathered the data and having determined the methodology to identify climate-specific or climate-related investment in the buildings sector, the information was broken down into areas corresponding to the framework for the overall landscape. We identified sources and end-uses, intermediaries and instruments.

The buildings sector is defined according to the typology of mitigation activities (see Annex 1). In the Belgian climate financing landscape, the following subcategories are considered in the analysis:

- Commercial and residential sectors (buildings):
  - Electric appliances, electronics and equipment (cat 1.1.1)
  - Retrofitting of existing buildings: Architectural or building changes that enable reducing energy consumption (cat 1.1.3).

In addition to the categories in Annex 1 and partly analogous to the Climate Finance Landscape 2012 of CPI we considered also:

- New construction energy efficiency
- Thermal and electrical renewable energy, construction and existing buildings.

Sector Findings

In the next paragraphs we detail the evaluation of each element of the Landscape. For a summary of assumptions made to analyze the data points, please refer to Annex 4.

Residential Electric appliances, electronics and equipment[23]

The total investments related to energy-efficiency improvements in appliances are calculated based on the available EE-related information for refrigerators and washing machines on the one hand and the total sales of major domestic electrical appliances in 2013 on the other hand. The scope of Major Domestic Appliances (MDA) is based on the framework of Gfk (washing machines, (tumble) dryers, refrigerators, cookers, dishwashers, built-in ovens, freezers, hobs, cooker hoods, microwave ovens, air conditioners). We calculated the average share of new appliances per efficiency class (A++, A+, A, B) and the (relative) average incremental unit cost per efficiency class compared to the average efficiency class (A), based on the information on the 'Impact of the energy efficiency factor on prices'[24]. The average efficiency class (A) is used instead of the minimum required efficiency (which is the general used methodology in this study) based on the success of the implementation of Ecodesign, which results in 95% of total sales being A, A+ and A++(+) appliances. The incremental cost and market share per efficiency class for refrigerators and washing machines are used to calculate the weighted average market share per efficiency class and these results are extrapolated for all major domestic appliances. The cost related to energy-efficiency improvement for appliances is finally estimated by calculating the incremental cost of total sales for major domestic appliances in 2013, based on the annual GfK TEMAX® reports[25] for efficiency class A, A+ and A++. This is estimated to be almost **EUR 120 million**.

The Flemish energy agency supports the purchase of energy efficient major domestic appliances by giving a reduction grant to low-income households. In 2013, the total amount of support granted by the

23 Some assumptions have been made based on the available information of 201 (see Annex 4).

24 Ecorys (2011). *Study on the Competitiveness of EU electrical and electronics goods markets with a focus on pricing and pricing strategies*. Retrieved from: http://ec.europa.eu/consumers/archive/consumer_research/market_studies/docs/competitiveness_study_electrical_and_electronic_goods_en.pdf

25 GFK (n.d.). *TEMAX reports*. Retrieved from: http://temax.gfk.com/en-be/

Flemish energy agency was **EUR 280.000.** The Brussels region also supports energy efficient refrigerators, freezers (energy class A++) and tumble dryers (energy class A) with the Grant F: Efficient domestic appliances. We couldn't retrieve more information from the Brussels and Walloon region[26].

RETROFITTING OF EXISTING BUILDINGS: ARCHITECTURAL OR BUILDING CHANGES THAT ENABLE REDUCING ENERGY CONSUMPTION

In Belgium, there are both on regional and national level supporting measures regarding energy efficient retrofitting. As they both support the same EE measures, the total private investments are calculated by using only the regional supporting schemes to avoid double counting. For the national supporting measure, the amount of public support has been taken into account as a financing source without estimating the related private investments.

The federal government supports **energy efficient retrofitting** by granting a tax reduction for 'energy reduction measures'. Households can reclaim 30% of total expenses for energy reduction measures limited to almost EUR 3.000 per year, with the possibility to spread expenses over 4 years. Since 2013 (income year 2012), tax reduction for new retrofits is limited to only roofing insulation, as a result, public support for energy reduction measures will decrease strongly during the following years. In 2013, the total Government expenses for 'Energy Reduction Measures' amounts to EUR 669 million, this includes also support for PV installations and solar heating systems. It is estimated that **EUR 341,5 million** are spend to support energy efficient retrofitting (based on the ratio of declarations by households of the different techniques supported by the tax reduction).

Regional governments of Brussels, Flanders and Wallonia have different supporting measures for Energy Efficient retrofitting.

The **'Rational Energy Use'** (REU) **grants** support different Energy Efficiency related measures (double glazing, insulation, solar boiler, heat pump), the amount of support is generally based on different aspects of the implemented measure (e.g. EUR/m^2 of insulation and EUR x COP x nominal installed capacity for heat pumps) and not on as a percentage of total expenses. The REU grants are available for households, enterprises and local institutions. In Brussels, the REU grants are distributed by IBGE (Public service responsible for the environment and energy at the Brussels-Capital Region). In Flanders the distribution grid operators (Eandis and Infrax) are responsible for distributing and financing the REU grants under supervision of and with limited financial support from the Flemish Energy Agency, VEA. In Wallonia, there are both REU grants from the Wallonia Public Service (SPW - DG04) and the distribution grid operators (e.g. ORES). For Brussels and Flanders both the total amount of REU grants and an estimation of the private investments related to the REU grants are included based on interviews with the responsible regional authorities. For the Walloon region, we only have information on the total commitments of the grant 'Energie et Logement'. REU grants are available for households, corporations and public institutions and **amount EUR 138 million in 2013**. In Flanders, the Flemish Agency for Social Housing (VMSW) provided the local housing agencies with an additional **EUR 28 million** for green energy grants for conducting energy reduction measures for social rented housing. After two years, only **21%** of the total available budget has been used.

'Green loans' are another important supporting scheme to support and finance EE investments. Initially, green loans were granted by the federal government, but this scheme has been reviewed in

[26] http://vallenergie.eu/wp-content/uploads/2013/05/aides_primes.pdf and http://www.lesoir.be/200024/article/economie/immo/2013-03-01/une-perc%C3%A9e-dans-jungle-des-primes-%C2%AB-%C3%A9nergie-%C2%BB

2012 and since then only households with a very low income can make use of the interest-free loans of the Fund for Reduction of the Global Energy cost (FRGE), founded by the Federal Government. As the financial means of the FRGE are distributed to social households through local entities of the Public Centre of Social Welfare, we do not have information about the yearly granted loans. On regional level, the Brussels ministry IBGE and the Belgian cooperative Credal grant green loans with '0% annual interest rate'. In Wallonia, the SPW-DG04 grants green loans in cooperation with the Société Wallonne du Crédit social (SWCS) and the Fonds du Logement de Wallonie (FLW). The IBGE and SPW are responsible for financing the 0% interest rate, while the social households need to repay their loan to the semi-public partners Credal, SWCS and FLW. The total EE loans in Wallonia and Brussels amount to **EUR 88 million**, considering the engagements of SPW and the reported loans of BIM & Credal. The granted loans are considered to be household investments. The zero interest rate financing is considered as public support and is estimated based on the reference rate of OLOs for the average duration of the green loans[27]. In Flanders, there are no (direct) green loans available. To compensate for the stopping of the Federal green loans, the amount of support of the REU and renovation grants has been raised for double glazing and solar boilers.

Besides REU grants and green loans, the regional governments also have other supporting schemes regarding retrofitting, e.g. renovation grants and grants for the adaptation and improvement of existing houses. Only part of the renovation grants is related to climate-related investments. As most retrofitting project are financed with both REU grants and renovation grants, renovation grants are not included to avoid double counting.

NEW CONSTRUCTION ENERGY EFFICIENCY[28]

The estimations of the total value of **energy efficiency in new residential constructions** are based on the reporting concerning the implementation of the European Performance of Buildings Directive (EPBD). The energy performance of buildings is quantified by the E-level, which depends on the thermal insulation, airtightness, compactness, orientation and the fixed installations (heating, ventilation, cooling, lighting and water heating). A declaration of the energy performance is required for every new building permit. In Belgium, there are tax incentives at federal level and measures at regional level to support the energy performance of new residential buildings. Based on the declarations of E-level in Flanders and the building permits in the Walloon region and Brussels, the total energy efficiency investments in new constructions amount **EUR 126 million** for households. These are considered to be the incremental cost to have an energy performance which is better than the minimal requirements by regulation. Until 2012, the Federal government granted a yearly tax incentive for a period of 10 years for zero-energy houses and nearly zero-energy houses. Federal expenses considering energy efficient construction will continue until 2022 (10 years) but will decrease over time (starting 2020). In 2012, the Federal expenses for supporting zero-energy houses amount **EUR 330.000** and **EUR 1 million** for nearly zero-energy houses. In Flanders, a reduction of the property tax is granted to new residential and commercial buildings that perform better than certain E-levels. The amount of tax reduction depends on the E-level and is based on the year of the building permit. In 2012, buildings with an E-level of E60 or lower are granted a 20% property tax reduction and buildings with an E-level of E40 or lower can benefit of a 40% tax reduction for a period of 5 years, which amounts to **EUR 2 million** for residential

[27] National Bank of Belgium. (2015). *Database Yield of Belgian government loans on the secondary market*. Retrieved from: https://stat.nbb.be/

[28] Our calculation is based on the available information of the residential EPB-declarations (Flanders), residential building permits (all regions) and incremental cost per E-level for a semidetached house, based on data of BouwUnie. There is no information available to make a more accurate estimation of the incremental building cost, but this gives a good indication of what can be expected.

and corporate buildings constructed in 2012. Similar regional support for energy efficient constructions have not been identified in Wallonia or Brussels.

THERMAL AND ELECTRICAL RENEWABLE ENERGY, CONSTRUCTION AND EXISTING BUILDINGS

The investments in renewable energy and CHP technologies are already discussed in the Energy Generation and infrastructure sector chapter. For the thermal and electrical renewable energy investments for both new constructions and existing buildings, only the investments in heating pump, solar thermal installations, and solar PV installations < 10kW are included. The total investment amount EUR 758 million.

Private investments (households & S.M.E.'s amount**) EUR 430million**. Investments in thermal and electrical renewable energy are supported by the federal tax reduction for energy reduction measures. It is estimated that in 2012, **EUR 328 million** was meant to support thermal and electrical renewable energy expenses of households. The assumption is made that the amount will be the same in 2013, giving that the household expenses can be spread over 4 years and tax reductions for renewable energy are discontinued since 2013. Enterprise Flanders also grants commercial institutions with an Ecology Grant Plus for renewable energy investments. The granted support in 2012 amounts to **EUR 1 million** for corporate actors (non-industrial, non-agricultural or non-transport sector). We did not include CHP investments for buildings as there is no information available about the division of total CHP installation.

2.1.4 Transport sector

SECTOR BACKGROUND

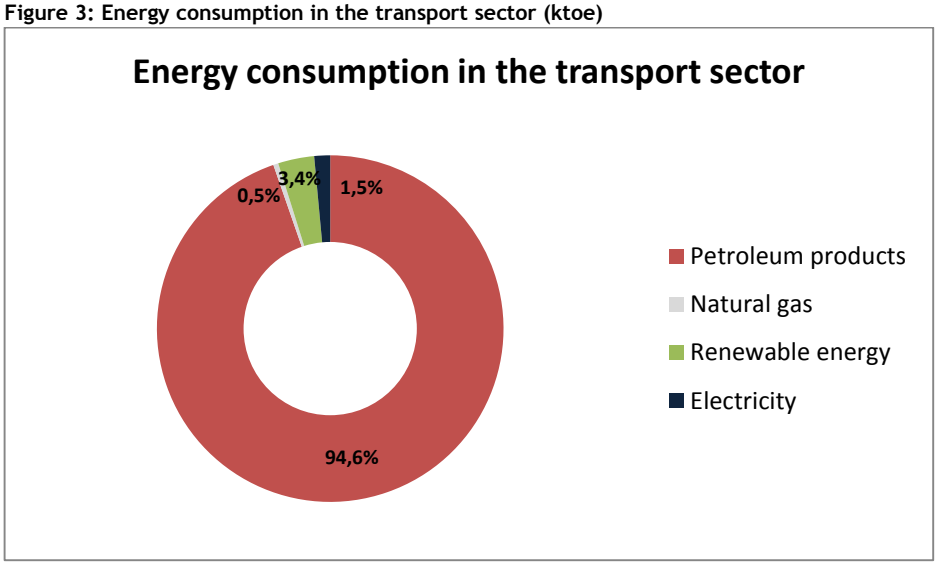
In 2013 the transport sector was responsible for 20,7% of the total greenhouse gas emissions in Belgium, compared to 18% in 2010[29].

In 2013 this sector was using 28% of the total energy consumption. More detailed information shows that the largest part can be allocated to road transport. The road sector is responsible for nearly 83% of the sector energy consumption, international aviation for 13%, rail for 2 % and domestic navigation (shipping) for 1,6%. Domestic aviation and pipeline transport are responsible for less than 0,6%. International navigation is not considered. Most of the energy consumption can be allocated to petroleum products namely 94,7% versus 3,4% to renewable energy (biofuels), 1,5% to electricity and almost 0,5 % to natural gas[30].

[29] Climate.be. (n.d.). *De bijdrage van de belangrijkste sectoren in de totale uitstoot en hun evolutie*. Retrieved from: http://www.klimaat.be/nl-be/klimaatverandering/belgie/belgische-uitstoot/belangrijkste-sectoren-de-totale-uitstoot

[30] Eurostat. (2015). *Energy balance sheets - 2013 data*. Retrieved from: http://ec.europa.eu/eurostat/documents/3217494/6898731/KS-EN-15-001-EN-N.pdf/e5851c73-9259-462e-befc-6d037dc8216a

Figure 3: Energy consumption in the transport sector (ktoe)



In the modal split of inland heavy duty (freight transport) in terms of ton-kilometers, road transport contributes to 64,5% of the total transport, with inland waterways covering 20,4% and railways 15,1%. Passenger car activity makes up 77,4% of the total passenger transport activity in terms of person - kilometers. Passenger transport by motor coaches, busses and trolley busses is covering 15,2%, with the remainder covered by trains (7,4%). This compares to a modal split in 2000 of 83% passenger cars, 10,8% motor coaches, busses and trolley busses and 6,3% trains. This shows a positive modal shift from road towards rail and public transport in the last decade[31].

There are numerous existing technologies and practices that can reduce GHG emissions in the transport sector. These include more fuel-efficient and hybrid vehicles, modal shifts from road towards rail- and waterway and public transport, and behavioural changes such as increased cycling and walking, and land-use planning. Furthermore, second generation biofuels, higher efficiency aircraft, and high efficient electric and hybrid vehicles as well as the underlying battery technologies have substantial abatement potential that can still be commercialized[32].

Sector Methodology

In gathering the data and determining the methodology to identify climate-specific and related investment in the transport sector, the information was broken down into areas corresponding to the framework for the overall landscape. We identified sources and end-uses, intermediaries and instruments.

The transport sector is defined according to the typology of mitigation activities (see Annex 1):

- Vehicle Energy Efficiency fleet retrofit (category 5.1)
- Urban transport modal change (category 5.2)
- Urban development (category 5.3)
- Inter-urban transport and freight transport (category 5.4)

Next to the categories mentioned above, **also Investment in Energy-Efficient street lighting** will be considered in the transport sector.

[31] Eurostat (n.d.). *Database Transport*. Retrieved from http://ec.europa.eu/eurostat/web/transport/data/database
[32] Ribeiro, K., et al. (2007). Transport and its Infrastructure. In Climate Change 2007: Mitigation. Retrieved from https://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter5.pdf

Sector Findings

The detailed figures and assumptions are mentioned for each element of the Landscape. A summary of the assumptions made to allocate the data input is given in Annex 5. A complete list of climate-related investments that we tracked but did not include in the Belgian Climate Finance Diagram is mentioned in Annex 5.

Vehicle energy efficiency fleet retrofit

In this category, existing vehicles, rail or boat fleet retrofit or replacement (including the use of lower-carbon fuels, electric or hydrogen technologies, etc.) are considered (5.1.1).
For energy efficient car purchases, we **limited our estimation to the climate-related investments considering electric vehicles**. There is no information available about the average specific energy consumption or greenhouse gas emissions of the vehicle fleet, which makes it impossible to estimate the purchases of energy efficient (non-electric) cars.

Electric vehicles in Belgium are supported by the federal government through a tax incentive. Since 2013, the tax incentive is only available for electric motorcycles, while both electric cars and charging stations were also supported in 2012. Households could fill in a share (40% for charging stations, 30% for cars and 15% for motorcycles) of the total purchasing price in their tax declaration, which amount EUR 11 million. For electric vehicles, only the incremental cost compared to non-electric vehicles is considered. Based on information received from FPS Health, Food Chain Safety & Environment, the evaluation of new alternative fuel vehicles by the Flemish Government (MIRA) and the yearly registered electric cars, the total incremental cost in 2012 amount **EUR 1,8 million for households** (only electric vehicles) and **EUR 13,5 million for corporates** (electric vehicles and charging stations).

The **Flemish Government** launched in 2011 a 5 year (2011-2015) **comprehensive Electric Vehicle program** with the Flemish Agency for Innovation through science and technology (IWT) and the Flemish living lab electric vehicles: 5 different platforms were set up with an overall budget of EUR 27 million (EUR 16 million financed by the public authorities and EUR 11 million private contributions) of which **EUR 5,4 million are considered for 2013** (EUR 3,25 million public support and EUR 2,15 million private investments). This program has allowed the development of **charging infrastructure in 172 different sites in Flanders**. In total 862 charging points have been made available thanks to this program.

The investments to facilitate the use of natural gas for transport purposes (CNG for cars and LNG for heavy vehicles and boats) can also be considered as climate related, as they contribute to reducing the GHG emissions of the transport sector. Since 2012 35 new CNG stations have been built in Belgium (EUR 14 million investment) and 2 LNG stations (EUR 2,5 million investment). Moreover, about 30 projects are currently in the study or development phase. These investments are mainly financed by private companies, with some financial aid (EUR 0,6 million from the gas association).
The gas sector (supply companies + TSO Fluxys) is also granting financial aid to companies or individuals that invest in vehicles on natural gas (EUR 2 million since 2012). Total investments in LNG/CNG stations is estimated **4,8 million in 2013, of which 4,1 million are sourced from corporate actors**.

Urban transport Modal Change

In Belgium, public transport infrastructure (except passenger and freight railway, *see inter-urban transport and freight transport*) is exploited by regional government-owned public limited companies. The climate-related investments in the urban transport are investments directly related to modal shift

and sustainable fleet. Therefore, we only included investments in new infrastructure to extend the metro and the light rail connectivity in our study as climate-related. Refurbishment or renovation of existing infrastructure are not taken into account. This is a more narrow methodology than the approach of the MDB's and EIB to include all investments.

Flemish public transport company De Lijn invested EUR 57 million in 2013 in sustainable public transport fleet, mostly EURO VI-engine diesel busses ad **18 hybrid busses**. Although De Lijn is planning to invest in light rail connectivity, infrastructure investments in 2012-2013 are not included as these projects are still in the (feasibility) study stage (e.g. the Spartacus plan).

In Wallonia, the public transport company TEC invested in the extension of the existing light rail connectivity of Charleroi. In 2013, the investments in extending the current railway infrastructure and the acquisition of a new multifunctional road-rail vehicle were EUR **1,4 million**. Each year TEC replaces approximately 100 old buses with new, diesel busses. The total average yearly investment in new busses is estimated to be EUR 25 million.

In Brussels, the MIVB/STIB invested EUR 206 million in total in 2013. Though most investments were made to improve the existing infrastructure, some investments to extend the current light rail connectivity were made, it is estimated that 2% if total investments are directly related to capacity extension. The MIVB invested EUR 64,3 million in new diesel busses (EURO VI engine).

Although the replacement of old busses with new EURO VI diesel busses inherits a substantial reduction in air and noise pollution and, indirectly, GHG emissions, they are not included as climate-specific investments due to various reasons (EURO VI is a European standard, EURO VI implies no additional cost,…) Hybrid busses have a direct impact on GHG emissions. The incremental cost of hybrid busses compared to EURO VI diesel busses is included as a climate-specific investment. The total investment in public transport sustainable fleet therefor amount EUR 1,8 million.

Non-motorized transport (bicycles and pedestrian mobility)

In Flanders, corporations are eligible for support from the **Pendelfonds** to finance projects concerning sustainable commuter traffic and modal shift. The means of the Pendelfonds are used for adjusting local infrastructure to encourage sustainable commuter traffic. The amount of support is 50% of the total project costs. In 2012, the Pendelfonds had a budget of EUR **11 million** and leveraged the same amount of private spending. Similar projects were not identified for the Brussels and Walloon region.

Urban Development

For the integration of transport and urban development planning (dense development, multiple land-use, walking communities, transit connectivity, etc.), leading to a reduction in the use of passenger cars, investments concerning cycle paths are considered to be climate related. The Brussel Government allocated EUR 13 million for investments in cycle paths, of which EUR 4,4 million was effectively spent. As these investments are not only related to modal shift (commuter travel) but also the maintenance of existing cycling paths and recreation cycling paths, we did not estimate the investment directly related to modal shift.

Inter-urban transport and freight transport

In this section railway transport directly stimulating modal shift of freight and/or passenger transport from road to rail (improvement of existing lines or construction of new lines) is included.

In Belgium, railway transport is organized nationally with two government-owned public limited companies being responsible for the railway infrastructure (**Infrabel)** and the freight and passenger transport (**NMBS**). The NMBS is the only company authorized for national passenger transport. In Freight transport, besides **NMBS Logistics**, there are some smaller, private companies which also use the Belgian railway infrastructure. As the private companies are internationally active and their freight infrastructure (trains) is not dedicated to the Belgian market, we have only included the investments directly related to modal shift of the national railway companies Infrabel and NMBS.
The investments in modal shift related to railway transport are assumed to be only infrastructure investments that improve the connectivity and capacity for both passenger and freight capacity (incl. HST). In 2013 Infrabel invested **EUR 399 million** to extend its railway capacity and to build the Regional Express Net, Diabolo and connectivity with the Belgian ports. These investments are a little over 30% of total investments in 2013.

The NMBS invested in 2013 for a total amount of EUR 604 million. **EUR 267 million** was invested in new and improved trains, directly supporting modal shift and sustainable railway transport. These investments increase the capacity for passenger transport and stimulate commuter traffic and modal shift. The remainder of the EUR 604 million was invested in safety, workplaces, IT and other services that are not included as these are not considered to support the modal shift.

Next to railway transport, also investments in **waterways are stimulating the modal shift of freight and/or passenger transport from road to waterways; investments to** improve existing infrastructure or to construct new infrastructure have been taken into account in this study and are obtained after interviewing the related public organisations.

The management of waterways is organized regionally In Belgium. In Flanders, two waterway operators, NV De Scheepvaart and Waterwegen en Zeekanaal NV are responsible for the management, exploitation and maintenance of the inland waterways. In Wallonia, the Wallonia public Service (SPW-DG02) is responsible for the inland waterway transport and in Brussels the '*Port de Bruxelles'* is responsible. The five ports in Belgium (Antwerp, Gent, Zeebruges, Oostende and Brussels) all have a port authority company which manages the port areas.

In Flanders, the waterway operators invested **EUR 44 million** in 2013 in modal shift. These investments leveraged **EUR 5 million of private investments** and NV De Scheepvaart received EUR 1,28 million European support. The NV de Scheepvaart en Waterwegen and Zeekanaal NV published a joint Masterplan 2015-2020 concerning inland shipping via the Flemish waterways (Horizon 2020). This masterplan contains all investments and initiatives necessary to anticipate future challenges regarding logistics and transport. Between 2015 and 2020 a total of EUR 2.750 million will be invested in reliable waterway infrastructure, expansion of the waterway network and the stimulation of inland waterway transport.

In Brussels, the public investments stimulating modal shift amounts to **EUR 20 million** in 2013. The Brussel authorities invested in the development of the canal, port, out-port and related installations. The focus of these investments is a more sustainable urban mobility leveraged by a multimodal approach and by using the economic development as a generator of employment.

The Wallonia public service, responsible for Economy, Employment and Research (SPW-DG06) subsidized private investments in cargo Infrastructure for inland navigation cargo traffic. In 2013, the total public support granted was **EUR 852.000**, which leveraged an estimated **total investment of EUR 2,5 million**. SPW-DG06 also granted support for sustainable fleet (replacement of motorization). The total support in 2013 is estimated **EUR 500.000** and leveraged EUR **1,2 million** corporate investments.

The total investment in inland waterway (modal shift and sustainable fleet) amount **EUR 74 million**, of which **EUR 65 million are public investments and EUR 9 million corporate investments**.

Investment in Energy Efficient Street lighting

In Belgium, the distribution network operators are responsible for managing the public street lighting. Investments in energy efficient street lighting are mostly related to the systematic replacement of inefficient equipment (e.g. mercury vapor lamps) by more energy efficient alternatives.

In Wallonia, ORES, the most important distribution network operator, replaced **15.000 mercury vapor lamps** with a more energy efficient variant. In Flanders, Eandis and Infrax invested a total of EUR 11 million in 2013. In Brussels, Sibelga replaced in 2013 about 5% of the total street lighting equipment (appr. 30.000 lamps) by more energy efficient alternatives. The total investment in EE street lighting is not considered, based on the fact that the replacement programs are in general strictly maintenance related (replacing the oldest lamps) and the energy efficient alternatives are mostly based on technical improvements over the years rather than extra investments in LED or smart street lights.

2.1.5 Agriculture sector

Sector background

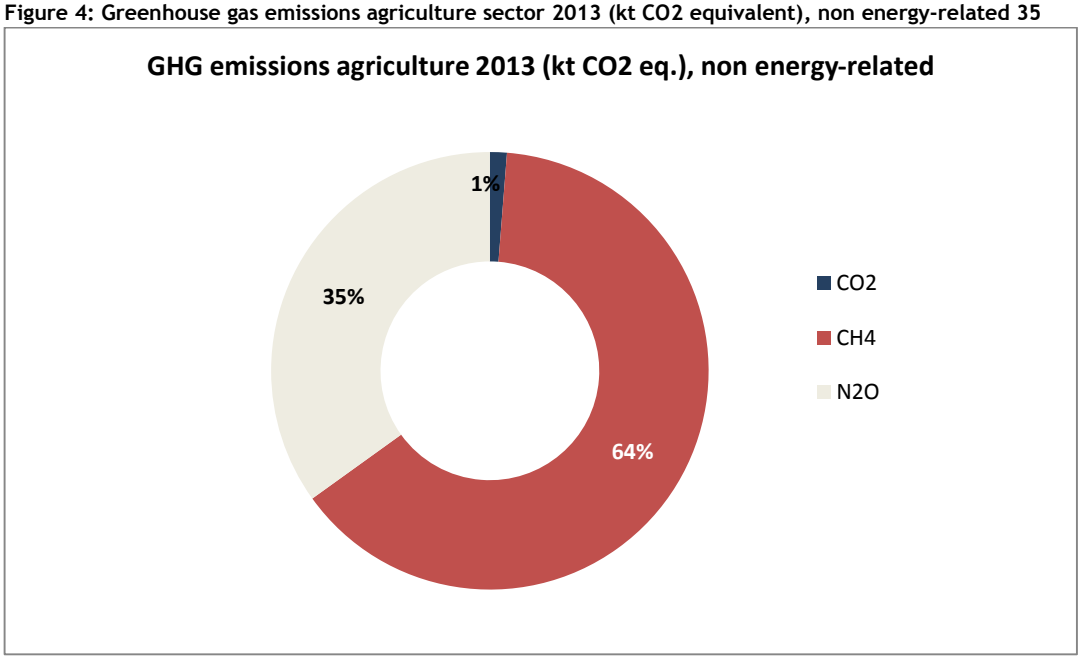
In 2013 the agriculture sector was responsible for a total contribution of 10,3% of the total greenhouse gasses in Belgium[33].

Various agricultural activities contribute to the greenhouse gas emissions. The most important sources of GHG emissions in the agricultural sector are:

- **Methane** (CH_4): GHG emissions are sourced from enteric fermentation (mostly from cattle) and manure management;
- **Nitrous Oxide** (N_2O): GHG emissions originating from agricultural soils[34].

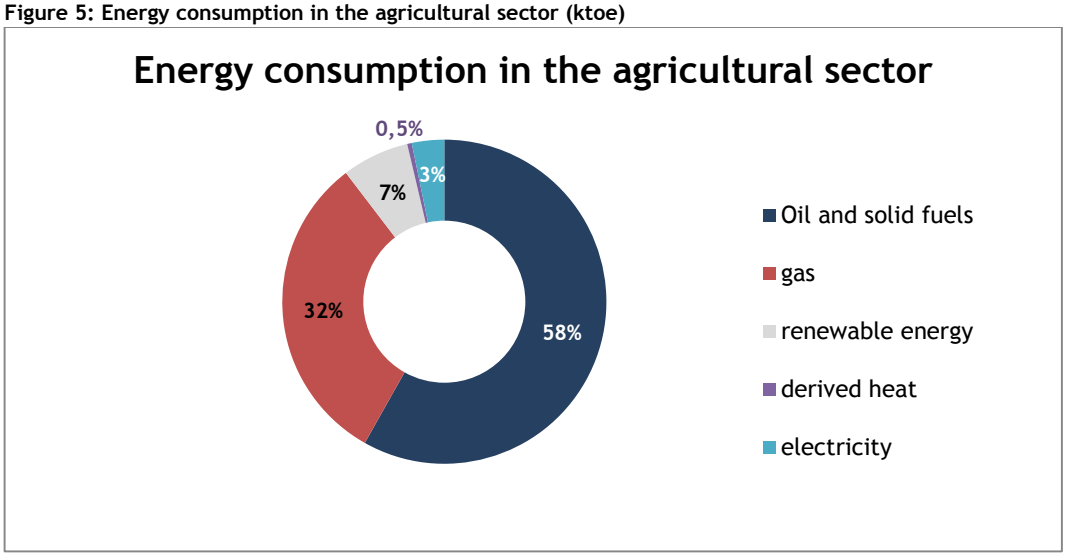
[33] Climate.be. (n.d.). *De bijdrage van de belangrijkste sectoren in de totale uitstoot en hun evolutie*. Retrieved from: http://www.klimaat.be/nl-be/klimaatverandering/belgie/belgische-uitstoot/belangrijkste-sectoren-de-totale-uitstoot
[34] UNFCCC. (2015). *Belgium's greenhouse gas inventory (1990-2013)*. Retrieved from: http://www.klimaat.be/files/9914/4707/2203/NIR_2015_final_291015.pdf

Figure 4: Greenhouse gas emissions agriculture sector 2013 (kt CO2 equivalent), non energy-related 35



Energy consumption is only a minor driver of total greenhouse gas production in the agricultural sector. The sector used 2,1% of total **energy consumption, which stands in contrast with the 10,5% of share in total GHG emissions and stresses the importance of methan and Nitrous Oxide in the overall emissions of the agriculture sector**. Of the total energy consumption of the sector, most can be allocated to oil and solid fuels, 58,2%, and natural gas, 31,5%. Energy consumption of other sources: renewable sources (6,7%), electricity (3,2%) and derived heat (0,5%) are lower[36].

Figure 5: Energy consumption in the agricultural sector (ktoe)



There are numerous measures to reduce greenhouse gas emissions in the agricultural sector. The European parliament categorises mitigation measures at farm level based on four categories:

[35] Climate.be. (n.d.). *De bijdrage van de belangrijkste sectoren in de totale uitstoot en hun evolutie - CRF-tabellen*. Retrieved from: http://www.klimaat.be/nl-be/klimaatverandering/belgie/belgische-uitstoot/meer-informatie
[36] Eurostat. (2015). *Energy balance sheets - 2013 data*. Retrieved from: http://ec.europa.eu/eurostat/documents/3217494/6898731/KS-EN-15-001-EN-N.pdf/e5851c73-9259-462e-befc-6d037dc8216a

Agronomy, livestock, energy and low carbon anti-environmental measures. These categories consist of more detailed measures as nitrous oxide balance, cover crops, conservation agriculture, manure storage and spreading, biomass for heating, photovoltaics, fuel and energy reduction and greenhouse gas assessments[37].

Sector Methodology

In gathering the data and determining the methodology to identify climate-related investment in the agricultural sector, the investments related to:

- energy efficiency measures to reduce energy consumption;
- low-emission measures and infrastructure to reduce greenhouse gas emission.
- Manure management

Sector Findings

In Belgium, Agriculture is governed regionally and is mostly situated in Flanders and the Walloon region. **In Flanders**, the Flemish ministry of Agriculture and fisheries is authorized for policy development, implementation, administration and evaluation considering agriculture, greenery, fisheries and rural area. The Flemish ministry supports the agricultural sector with the Flemish Agricultural investment fund, VLIF (Vlaams Landbouwinvesteringsfonds). In 2013, the Flemish government granted EUR 5 million of support for EE-related investments (energy-screens, CHP installations, heat buffering, etc.), leveraging EUR 13 million corporate investments[38]. Since the EE-measures supported by the VLIF are 100% climate-related (and do not inherit a activity- or infrastructure-related share), the total investment is included. Therefor the Energy efficiency investments in agriculture in Flanders amount **EUR 18 million for 2013.**

Furthermore, VLIF supported emission reduction measures and infrastructure, mostly low-ammonia emitting infrastructure (**EUR 10 million**) and manure management investments (**EUR 76.000**), leveraging EUR 39 million corporate investments. The investments in low-emission measures & infrastructure and manure management are **mostly activity-related investments rather than climate-related investments.** Therefore, only the government support (EUR 10,1 million) is considered as climate-related for manure and low-ammonia emitting infrastructure rather than the total investment. It is assumed that the government support covers the total incremental cost, necessary to make the infrastructure low-ammonia emitting and implementing a more sustainable manure management – based on the Flemish legislation.

Total climate specific and – related investment in the Flemish Agricultural sector amount **EUR 28 million**, of which **EUR 13 million** are sourced from corporate actors (only EE-related investments) and **EUR 15 million** are public support (EE-, manure- and low-ammonia emitting infrastructure related support) from the VLIF program.

The Flemish ministry also has its own research centre: the Institute for Agricultural and fishery research, ILVO (Instituut voor Landbouw- en Visserijonderzoek) – which is considered in section 2.3. Climate Services.

[37] European Parliament. (2014). *Measures at farm level to reduce greenhouse gas emissions from EU agriculture*. Retrieved from: http://www.europarl.europa.eu/RegData/etudes/note/join/2014/513997/IPOL-AGRI_NT%282014%29513997_EN.pdf

[38] In 2013, the VLIF only received 6 million euro from the EU for PDPO II measures, seen as not EE related (annual report VLIF, 2013).

In Wallonia, the ministry of public service Agriculture, Natural resources and Environment (SPW-DG03) is responsible for the agriculture sector. In Brussels, the agricultural sector is (almost) non-existing and is therefore not treated. As we do not have information concerning investments or support in the Walloon region, the investments are estimated based on the data of the Flemish VLIF support and a comparison between the profiles of the Flemish and Walloon agricultural sector. The total investments in energy efficiency measures in the Walloon region is estimated at **EUR 9,2 million, based on the extrapolation of the number of agricultural companies in both regions and the total investment in the Flemish region** (private and public contribution are taken into account). The incremental cost of low-emission infrastructure is estimated at **EUR 1,63 million, based on the total number of livestock in both regions, which is significantly lower in the Walloon region**. The incremental cost for manure management is estimated EUR 87.083, based on the cultivated farming land in both regions, which is higher in Wallonia. For both low-emission infrastructure and manure management the extrapolation is based on only the amount of public support in the Flemish region. Since there is no information available of possible supporting schemes for the Wallonia agricultural sector regarding energy efficiency, low-emission infrastructure or manure management, the assumption is made that the investments in the Walloon region were 100% corporately financed[39].

2.2 Climate adaptation

SECTOR BACKGROUND[40]

OECD defines climate adaptation investments as activities "intending to reduce the vulnerability of human or natural systems to the impacts of climate change and climate-related risks, by maintaining or increasing adaptive capacity and resilience"[41].

The EU strategy on adaptation to climate change aims at making Europe more climate-resilient. Taking a coherent approach by complementing the activities of Member States, it supports action by promoting greater coordination and information-sharing and by ensuring that adaptation considerations are addressed in all relevant EU policies. Adaptation action is needed to protect people, buildings, infrastructure, businesses and ecosystems. Due to the varying severity and nature of climate impacts between regions in Europe most adaptation initiatives will be taken at national, regional or local level. Likewise, the ability to cope and adapt also differs across population, economic sectors and regions within Europe. All countries are at different stages of preparing, developing and implementing national adaptation strategies.

In Belgium, a national adaptation strategy is available since 2010 and a draft of the National adaptation plan (2015-2020) is under finalisation. The regional and federal governments have adopted or are in the process of finalising their specific adaptation plans. The Flemish government adopted the Flemish Climate Policy plan 2013-2020 in June 2013, including a section about adaptation: the Flemish Adaptation Plan (VAP). The Brussels government adopted its Air-Climate-Energy Code in May 2013, which serves as a legal basis for the integrated Air-Climate-Energy Plan which is currently being adopted. Other plans including adaptation measures in Brussels are the regional water management plan, including a flood prevention plan, and the 'Sonian Forest' management plan, focussing on

[39] This assumption could be modified if information of the Walloon government comes available.
[40] European commission. (n.d.). *European Climate Adapation Platform - Countries, regions and cities*. Retrieved from: http://climate-adapt.eea.europa.eu/countries/belgium
[41] OECD. (2011). Handbook on the OECD-DAC Climate Markers. Retrieved from: http://www.oecd.org/dac/stats/48785310.pdf

ecologic nature conservation and biodiversity. The Federal and Walloon adaptation plans are still into adoption process.

"The Federal adaptation plan is based on the exploratory study of the federal contribution towards a coherent policy concerning climate adaptation (2013). The draft Federal Adaptation Plan covers a period of 6 years and identifies 34 federal adaptation actions, addressing 10 sectors: (transport, economy, energy, marine, research, health, development cooperation, international security, crisis management during disasters and agriculture).

The Walloon government adopted its "Climate Decree" giving a legal framework to climate policy in Wallonia. The main implementation instrument is an "Air-Climate-Energy Plan" which should contain a section on adaptation. This section summarises the impacts & vulnerability assessments and detailed adaptation actions in several sectors. Water management, forestry guidelines and agricultural advice are some examples of these actions. The draft plan was submitted to a public survey in June 2014"[42].

Besides the above there is also Mayors Adapt[43]. This Covenant of Mayors Initiative on Climate Change Adaptation has been set up by the European Commission to engage cities in taking action to adapt to climate change. Cities signing up to the initiative commit to contributing to the overall aim of the EU Adaptation Strategy by developing a comprehensive local adaptation strategy and/or integrating adaptation to climate change into relevant existing plans. This initiative is only launched in 2014 and hence not relevant for this analysis (currently, 6 local authorities have joined this initiative and therefore have developed concrete projects).

Sector Methodology

One of the key policy instruments through which the public authorities can influence climate resilience of infrastructure is funding infrastructural investments. All kinds of technical infrastructure – transport, power grids, water supply, sewage, buildings and dikes – need to be assessed for resilience to current risks and future climate changes, and upgraded accordingly.

For this analysis, due to the limitation of data but also due to the fact that most of climate adaptation related activities are still in the planning phase, this study will primarily focus on infrastructure investments to flood control by adjusting dike heights and the construction of flood gates and flood reservoirs. Consequently, most of the adaptation related investments are currently made under the section climate services (e.g. R&D and consultancy expenses).

Sector Findings

In Flanders, the inland waterway operators NV De Scheepvaart and Waterwegen en Zeekanaal NV are responsible for water management. Climate change leads to a greater chance of flooding from both the sea and inland waterways. By investing in flood control, the waterway operators limit and prevent damage as a result of flooding. In 2013, NV De Scheepvaart invested **EUR 830.000** in water management and Waterwegen en Zeekanaal NV **invested EUR 44 million.**

Climate adaptation investments are limited to the inland waterway operators, as they are one of the first public organisations to implement measures directly related to climate adaptation (prone to flooding). Based on the different adaptation plans, investments in climate adaptation will increase

[42] EEA. (2015). *Belgian reporting on national adaptation actions under the MMR*. Retrieved from: http://cdr.eionet.europa.eu/be/eu/mmr/art15_adaptation/envvqfejw/
[43] Mayors Adapt. (n.d.). *Mayors Adapt - about*. Retrieved from: http://mayors-adapt.eu/about/

within the next years. Besides the climate adaptation investments, also climate adaptation services can be identified (see below). Based on the available data, the total cost of climate adaptation services is much higher, meaning climate adaptation related activities (R&D, consultancy, studies, etc.) are increasing.

2.3 Climate services

Sector background

According to the European Commission's Climate Services Initiative, activities in climate services are defined as "transforming climate-related data and other information into customised products such as projections, trends, economic analysis, advice on best practices, development and evaluation of solutions, and any other climate-related service liable to benefit that may be of use for the society"[44].

In 2013, the total R&D expenditure in Belgium amounted to 2,28% of total GDP. Compared to the other EU-28 countries, which have an average gross domestic expenditure on R&D of 2,01% of GDP, Belgium has one of the highest relative R&D expenditures. The relative Belgian R&D expenditure has increased since 2005, which illustrates the Belgian engagement for innovative research and the ambition to reach the European 3% of GDP target for R&D expenditure in 2020.

R&D expenditures are mainly financed by the business enterprise sector. In 2011, the business sector contributed 60,2% of total R&D expenditures, well above the 55% average of the EU-28 countries. Meanwhile the government sector funded 23,4% of total R&D expenditures and 13% were sourced abroad[45]. In 2011, 94.424 persons were employed in R&D activities, mostly in higher education and universities (50%) and businesses (45%), which results in the total share of research representing 0,94% of the total FTE's in Belgium[46].

Research and development expenditure is an important driver of the development and promotion of innovative measures to increase sustainable energy production and decrease energy consumption and GHG-emissions. There are numerous national and European programs supporting R&D projects, knowledge sharing and the promotion of innovative measures increasing energy-efficiency and sustainable energy production.

Sector Methodology

In gathering the data and determining the methodology to identify intangible investment related to national and European R&D programs and the service sectors, the information was broken down into areas corresponding to the framework for the overall landscape. We identified sources and end-uses, intermediaries and instruments.
In case the contribution was part of a multi-annual program (which is the case for most climate-specific and climate-related measures supported by European research and innovation programs), the contribution to Belgium was divided by the total years (assuming that the contributions are equal amongst the years). In case the project duration is not known, we estimated the project duration in the most conservative way and divided it by maximum number of years of the program.

[44] European Commission. (n.d.). Climate actions – climate services. Retrieved from: https://ec.europa.eu/research/environment/index.cfm?pg=climate_services
[45] Eurostat. (n.d.). *Database Gross domestic expenditure on R&D*. Retrieved from: http://ec.europa.eu/eurostat/web/products-datasets/-/t2020_20
[46] Belspo. (2013). *Bemoedigende cijfers voor onderzoek en ontwikkeling in België*. Retrieved from: http://www.stis.belspo.be/docs/pdf/pressrelease_July2013_NL.pdf

The intangible climate-specific and climate-related investments are defined according to the funding for research and innovation programs and other climate services:

- Climate-specific and climate-related measures supported by European research and innovation programs
- Climate-specific and climate-related measures supported by national and regional research and innovation programs
- Corporate Climate Services

Sector Findings

Climate-specific and climate-related measures supported by European research and innovation programs

From all European funding related to Belgian climate activities, only the funding coming from the **ERDF, LIFE+, EIB and FP7** are included as they can be directly allocated to climate-specific and related research and innovation. The financial streams are calculated based on an annual basis (thus an annual average for the whole EU-project period was calculated).
The funds allocated to EU-projects are shared among various different countries, and therefore the EU contribution is not to be enjoyed by Belgium alone. Our approach to quantify what goes to Belgium has been to divide the amount of the total EU contribution by the total amount of participating countries.
The total amount of national contribution is estimated based on the maximum share of EU contribution within the program (40% for ERDF, 44,5% for LIFE+ and 50% for FP7).
The beneficiaries of EU-projects are mainly universities and research centres, therefore the leveraged national contributions are estimated to be sourced 50% from public (national) budgets and 50% from corporate actors.

The **ERDF** focuses its investments on several key priority areas: Innovation and research, the digital agenda, support for small and medium-sized enterprises (SMEs) and the low-carbon economy. ERDF action is designed to reduce economic, environmental and social problems in urban areas and focusses on sustainable urban development. The projects of the 2007-2013 period within the themes 'environment', 'energy', 'transport' and 'urban development' are included[47]. The total financial stream related to the **ERDF projects for 2013 amounted to EUR 2,5 million**, of which EUR 1,8 million are sourced from public budgets (60% EU and 40% national public budgets) and approximately EUR 750.000 of corporate actors.

LIFE is the EU's financial instrument supporting environmental, nature conservation and climate action projects throughout the EU. Only projects under the (sub) themes 'climate change adaptation' and 'climate change mitigation' which include GHG reduction in EU ETS sectors, carbon sequestration, energy efficiency, GHG reduction in non EU ETS sectors, renewable energies are considered. In 2013, the total financial flow related to the **LIFE program amounted to EUR 3,5 million**, of which EUR 2,5 million are sourced from public budgets (60% EU and 40% national public budgets) and approximately EUR 1 million of corporate actors.

The EIB is the European Union's bank; its mission is to promote EU's objectives by providing long-term financing on favourable terms. A look at the **EIB** funded projects database for the period 2007-2013 shows that the funds allocated in Belgium by the EIB with respect to climate revolve around offshore wind energy and stimuli to renewable energy projects. These investments (EUR 111 million of

[47] Additionally, to ensure no climate related project is left out, the search function has been used to search for the terms 'climate', 'adaptation', 'adapt', 'mitigation', and 'CO2'.

concessionary loans) are included in the climate mitigation activities related to energy generation and infrastructure.

FP7 was the European Union's Research and Innovation funding program for 2007-2013 (current program is Horizon 2020). Only projects related to 'climate change and carbon cycle research', 'renewable sources of energy', 'environmental protection', and 'energy saving' are included. The total financial flow considering the **FP7 project in 2013 amount EUR 13 million**, of which EUR 9,5 million are sourced from public budgets (57% EU and 43% national public budgets) and approximately EUR 3,5 million of corporate actors.

CLIMATE-SPECIFIC AND CLIMATE-RELATED MEASURES SUPPORTED BY NATIONAL AND REGIONAL RESEARCH AND INNOVATION PROGRAMS

The federal research program 'Science for a Sustainable Development' is the continuation of the first and second Scientific Support Plan for Sustainable Development Policy (SPSD I (1996–2001) and SPSD II (2000–2005). It covers eight priority themes, including energy. The program funds 115 research networks with a total budget of EUR 70 million. Funding is managed by the Belgian Science Policy Office (BELSPO). Only the projects of the 'Climate' program (2010-2015) are included. The share of the budget for 2013 amounts to **EUR 1 million**, which is calculated based on an annual basis (thus an annual average for each SSD-project period was calculated). In 2012 a new federal research program has been launched under the name BRAIN-be (Belgian Research Action through Interdisciplinary Networks). It covers 6 thematic areas, amongst which 2 are focusing on climate related research. The total budget for the 1st phase (2012-2017) amounts to EUR 117 million. The share of the budget of 2013 for the BRAIN-be project amount to **EUR 2,23 million**, which includes only the projects under the 'Climate program'. This is calculated based on an annual basis and divided by the number of participating countries for the networking-projects.

The **Brussels Government** has a total budget of **EUR 96 million** in 2013 for the support of scientific research and the promotion of energy efficiency and regulation of the energy market. No R&D budget of the Brussels region is included in the climate finance diagram since there is no information available about the share of the total budget that is climate-related. For Innoviris, the Brussels Institute for the encouragement of scientific research and innovation (which is included in the total R&D budget of Brussels), 4% of the total budget for R&D was granted for projects related to 'Energy, Transport and environment', but there is no further information available about the share of climate-related investments.

The Plan Marshall 2.Vert of the **Walloon government**, with a total budget of EUR 2,9 billion for 2010-2014, is the follow up to Wallonia's previous Marshall Plan. The share of the budget dedicated to research is EUR 277 million, of which technological projects (in which energy research can be carried out) amount approximately EUR 121 million. The Plan encourages green growth and sustainable development. It has six sections: human capital; competitiveness clusters; scientific research; economic framework; employment and environment; and social welfare. Activities related to energy research do not have a dedicated budget, but are included in several sections of the Plan. Based on the specific environmental aspect of the Plan Marshall 2.Vert, the energy research is considered to be 100% climate-related. Therefor the total climate-related research amount **EUR 24,2 million** in 2013, which is less than 1% of the total budget of the Plan Marshall 2.Vert.

In **Flanders**, there are different agencies supporting research and innovation. By 2020 Flanders wants to stand out as an economically innovative, sustainable and socially caring society. One of the main objectives of ViA (Flanders in Action) is to achieve a competitive and sustainable economy. ViA will apply the transition method to 13 great societal challenges, some of which are (more or less) climate and energy-related: smart mobility, renewable energy and smart grids, sustainable materials management, sustainable cities, sustainable living and buildings, new industrial policy, and streamlining of targeted innovation policy.

The **Enterprise Flanders** supports different research and innovation projects concerning energy efficiency and renewable energy integration. The New Industrial Policy (NIB) of Enterprise Flanders, supports projects concerning 'The factory of the future', the ESKIMO fund stimulates the private ESCO-market and the S.M.E. portfolio supports training, coaching, advice and technology exploration by S.M.E.'s. The Enterprise Flanders **invested EUR 2.930 million in climate-related research & innovation projects, leveraging EUR 750.000 of corporate investment in 2013.**

The **Flemish Energy Agency (VEA)** supports different energy-related research and innovation projects and stimulates energy-efficiency measures by financing energy scans for households and commercial institutions. With the impulse projects, VEA co-finances and monitors market introduction projects, demonstration projects and European projects. With COGEN, VEA stimulates the development of high quality CHP-installations in Flanders by organizing an expert center and meeting place. With ODE, VEA does the same for other sources of sustainable energy. VEA also financially supports and monitors the distribution net operators, who are responsible for distributing the free energy scans and also perform other innovation-related projects. Infrax and Eandis, for example, invest in smart meters, have a yearly innovation budget and perform ESCO feasibility studies and audits, in particular for municipalities. **VEA and the distribution net operators invested EUR 23 million in innovation & development projects** and the **promotion of energy-efficiency and sustainable energy in 2013.**

The **Institute for Agricultural and Fisheries Research (ILVO)** is a Flemish research center performing multidisciplinary, innovative and independent research, with the focus on sustainable agriculture and fisheries. **The total public investments in energy-related research are estimated to be EUR 500.000, leveraging EUR 350.000 of private investments in 2013.**

The **agency for innovation by Science and Technology** (IWT) is the government agency helping Flemish companies and research centers in realizing their R&D projects, by offering advice, a network of potential partners and financial funding. The IWT supports different R&D projects financially. The total public support in 2013 for climate-related R&D projects is estimated to be EUR 6 million, leveraging EUR 3,4 million of corporate investments**.**

The Environmental and Energy Technology Innovation Platform (MIP3), brings together important players (authorities, businesses and research organisations) in various areas related to environmental and energy technology. MIP is both an innovation platform and an innovation program. The MIP3 budget (2012-2013) was about EUR 4 million, estimated to be EUR **2 million** annually.

Smart Grids Flanders is a platform for companies and organisations involved in developing the energy networks of the future. The smart meters/grids Linear project (2009-2014) was a large demonstration & deployment project on smart grids and smart homes, which also included an e-mobility part. The overall budget was EUR 40 million, of which EUR 10 million was financed by the Flemish government.

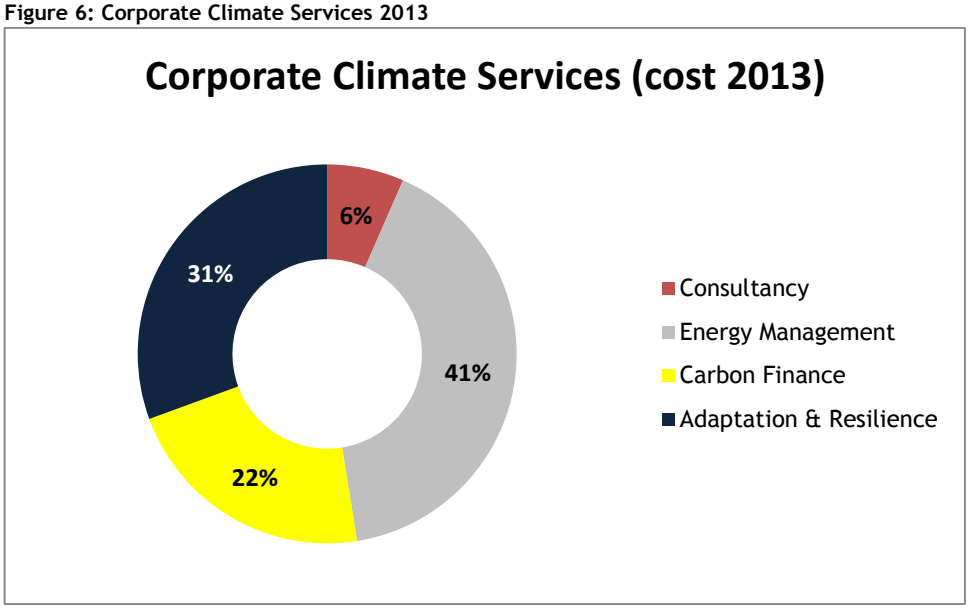
Generations is an industrial technology platform for renewable energy technologies in Flanders. This innovation platform has initiated several major strategic initiatives, e.g. for PV, wind energy, bio-energy and tidal and wave energy. As detailed budget figures are not available, we have not included this initiative in the quantitative overview.

Corporate Climate-Services

We define 'corporate climate services' as consultancy services[48] in renewable energy activities[49], carbon finance activities, energy management services related to low carbon activities finance and management services related to adaptation and climate resilience. The best available database for these kind of activities is the Low Carbon Environment Goods and Services (LCEGS) database which also includes data for Belgium. The LCEGS database calculates the sales figures for these type of activities which is not the same as investments. However, as we are looking here specifically at services, we know that the turnover of the companies providing these services is highly correlated with the cost (investment) of their personnel. We assume that 60% of the sales figures are related to these costs[50]. The total **amount of climate services cost in 2013 is EUR 844 million**.

To estimate the total corporate contribution to climate services, only the LCEGS data is included and not the estimated share of corporate contribution to the EU programmes and the national and regional R&D programmes as they are included in the LCEGS (sales) figures and would inherit serious risks of double counting. At the same time, we also know that an important part of these corporate climate services is initially financed by the public sector as quite some research and advisory services are funded by national and European public institutions/administrations. The reason why we have not split it further up between public and private is that there is no evidence about the public share.

Figure 6: Corporate Climate Services 2013



[48] Consultancy services are defined as services related to General Information Provision, Specialist Strategic Development Planning, Legal & Advisory and Consultation & Lobby.
[49] Renewable energy consultancy activities are split up into RE consultancy services for the corporate and public sector, insulation technologies, fuel technologies and most renewable energy technologies.
[50] We assume that 60% of the sales figures is a good proxy for the personal costs of these kind of companies. We exclude the overhead and acquisition costs.

3 The Belgian climate finance landscape

3.1 The Belgian Climate Finance Diagram

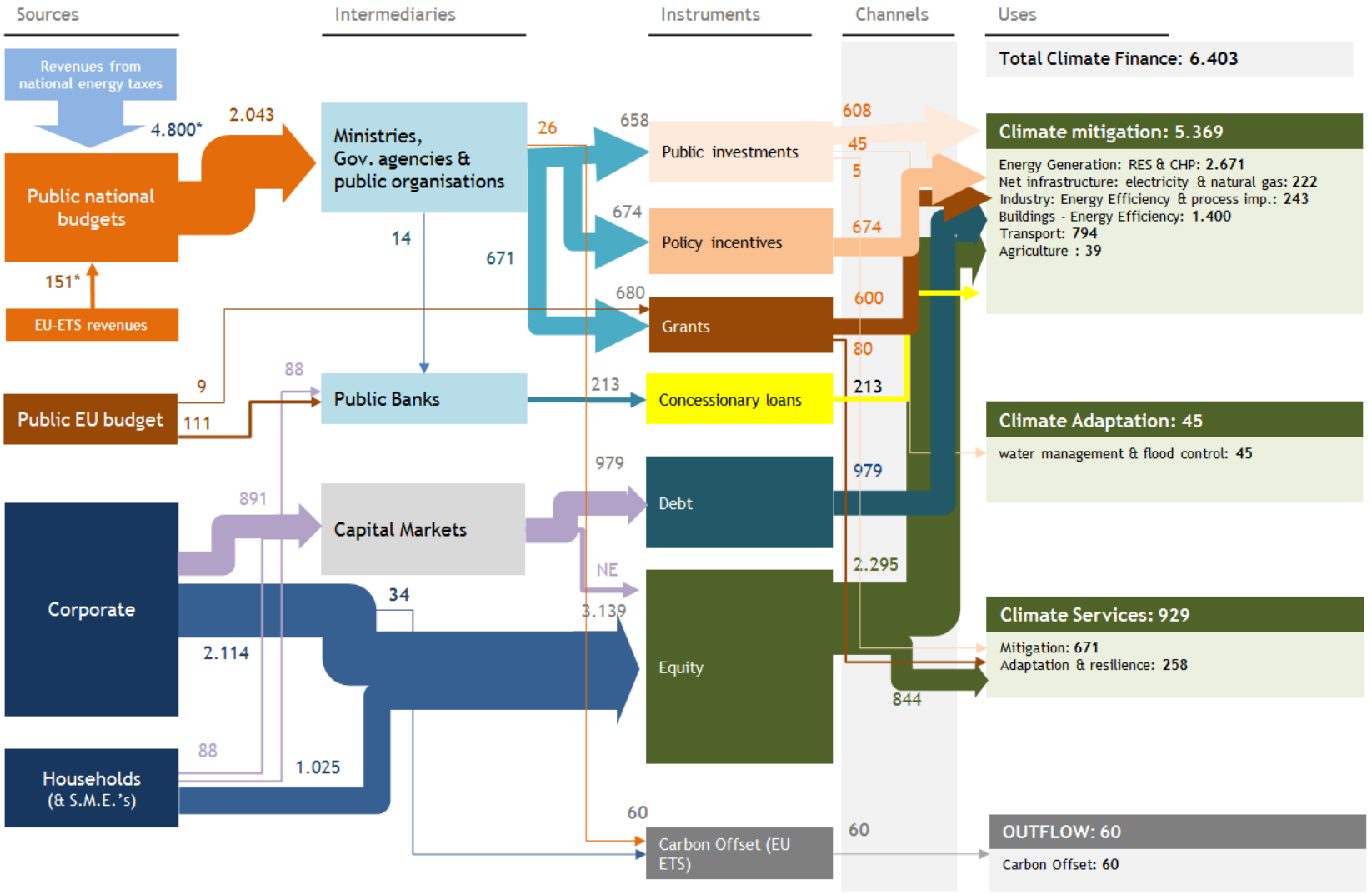
The Belgian Climate Finance Diagram gives an overview of the different financial flows which were identified and described in chapter 2 - The Belgian climate activities. The reference year of the climate finance diagram is 2013, providing the most actual and comprehensive information available. In exceptional circumstances, if there was no information for 2013 or 2014 available, data of 2012 was used. This is only applicable for the buildings and transport sector. If investments spread multiple years, the total reserved/allocated budget (gross value) is taken into account rather than the yearly disbursement share to calculate the yearly average budget (thus the total budget was used to calculate a yearly average).

As stated in the previous chapters the financial streams are allocated to the different sources, intermediaries, instruments and uses. For the **sources,** a division is made between public sources (national public budgets and EU budget), corporate sources and households. The **intermediaries**, acting as a mediator for climate finance, are separated in private capital markets and the public actors such as ministries, government agencies, public organisations and public banks. There are different **channels** through which climate finance flows (e.g. bilateral and multilateral climate funds), though they are not quantified individually, caused by the lack of transparency and the rather limited role of intermediaries in national climate finance in Belgium. The destination of the climate finance is split in different **uses**: (tangible) climate mitigation and climate adaptation finance and the intangible climate services. All these different actors and other relevant steps of the climate finance flow will be discussed in this chapter.

As discussed in section 1.3 – Analytical framework, the financial streams are mostly identified by analysing the data reported to and available from public institutions, in combination with expert interviews. The climate finance diagram provides, in combination with the sector analyses (tables per sector in annex), an overview of the different climate finance activities. Where there was a lack of data, assumptions have been made based on macro-economic figures rather than the (possible) effect of effective (regional) government support. This was in particular the case for some sectors in the Walloon region but to a lesser extent also for Brussels and Flanders. The obtained figures are considered to be sufficiently robust considering the assumptions made, but they can be reviewed when actual information becomes available.

We believe nevertheless that the climate finance diagram gives a comprehensive overview of the different climate activities and related financial streams. It also provides a framework for further refinement, considering the climate finance activities will be tracked more thoroughly by the different actors involved.

NATIONAL CLIMATE FINANCE DIAGRAM 2013 (in EUR million)

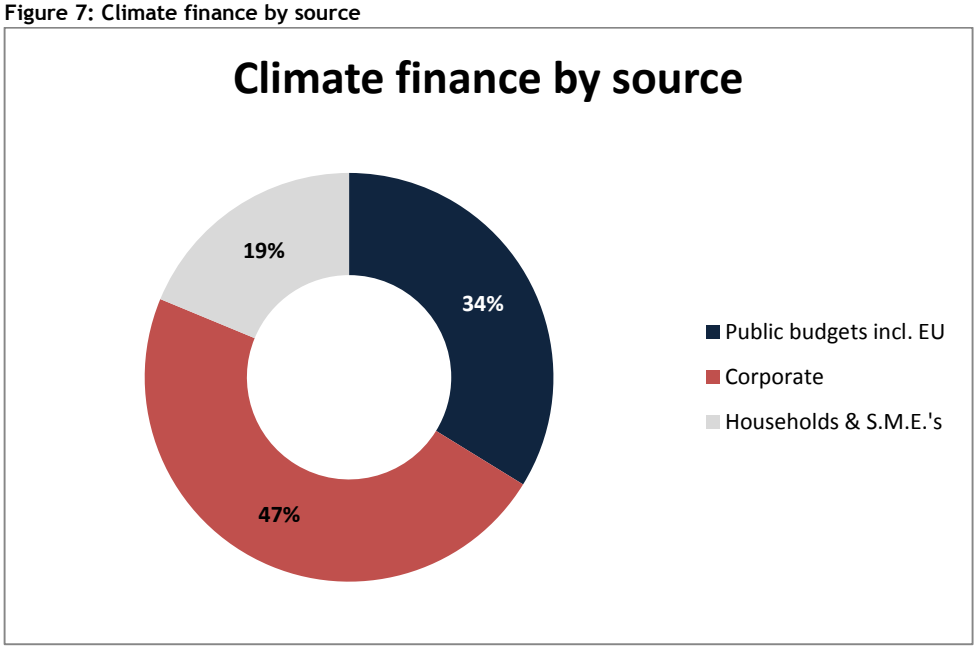


*Note: Not all revenues from national energy taxes are used for climate financing. Hence, the numbers in the top left 'Public budgets' box do not add up

3.2 The sources: who invests and how much?

Figure 7 (below) gives the split for climate services, climate adaptation and climate mitigation by source. Of the **EUR 6,4 billion of climate finance in total**[51], corporate finance contributes 47%, followed by the public budgets incl. EU contributions (34%) and households (19%). The EU contribution to national climate finance is limited (2%), though it should be stated that we only considered public support as being sourced from EU budget if there is a direct association between the project or program and the EU funding. In some cases, EU funds flows through public governments and agencies to certain programs which cannot be identified separately.

Figure 7: Climate finance by source



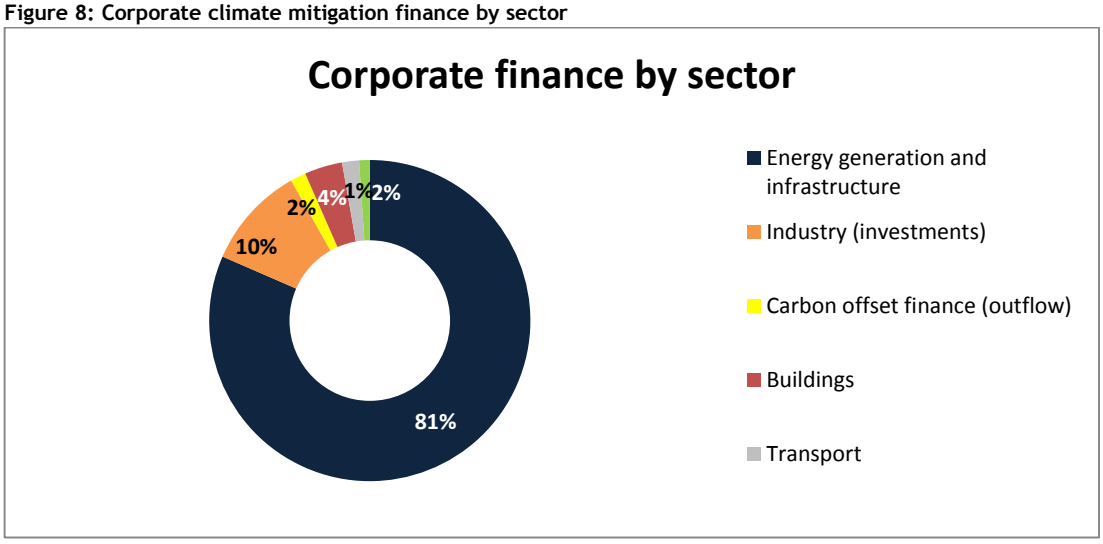
3.2.1 *Corporate finance*

With **EUR 3 billion**, corporate finance represents almost half of the national climate finance. Corporate finance contributes to both climate mitigation and climate services activities.

Climate mitigation activities amount to **EUR 2,2 billion**, which is 71% of total corporate climate finance. Climate mitigation activities are spread over all sectors.
The corporate investments in the Energy generation and infrastructure sector amount to **EUR 1,8 billion**, being the largest share of corporate finance. These are capital investments in renewable energy generation and CHP. Industry is the second largest contributor with **EUR 227 million.** The buildings sector, transport sector and agricultural sector contribute **EUR 145 million** in total, consisting of mainly energy efficiency investments. A large share of these financial streams are incremental cost for energy efficient alternatives (e.g. energy-efficient building retrofitting). Carbon offset finance is estimated to be EUR 34 million for corporate actors, and is considered as an outflow.

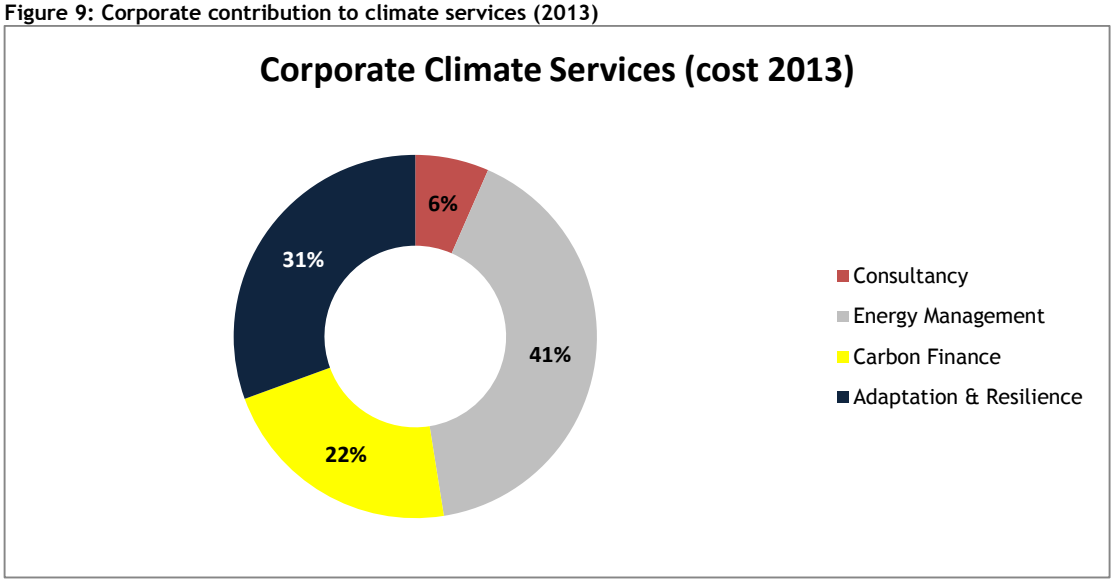
[51] EUR 6,4 billion is carbon offset finance included. If we exclude carbon offset finance, climate finance adds up to EUR 6,34 billion.

Figure 8: Corporate climate mitigation finance by sector



Corporate contribution to climate services amount to **EUR 844 million**, consisting of corporate climate services related to energy management, consultancy, carbon finance and adaptation and resilience. The high share of corporate climate services related to adaptation & resilience indicates the increasing activities in the readiness phase of climate adaptation, which is mentioned in chapter 2.2 Climate Adaptation. The corporate contribution of climate services related to R&D projects funded by European or national programs are included in the total corporate climate services to avoid double counting. As the European and national projects are supported with public funding, the private financial contribution is limited.

Figure 9: Corporate contribution to climate services (2013)

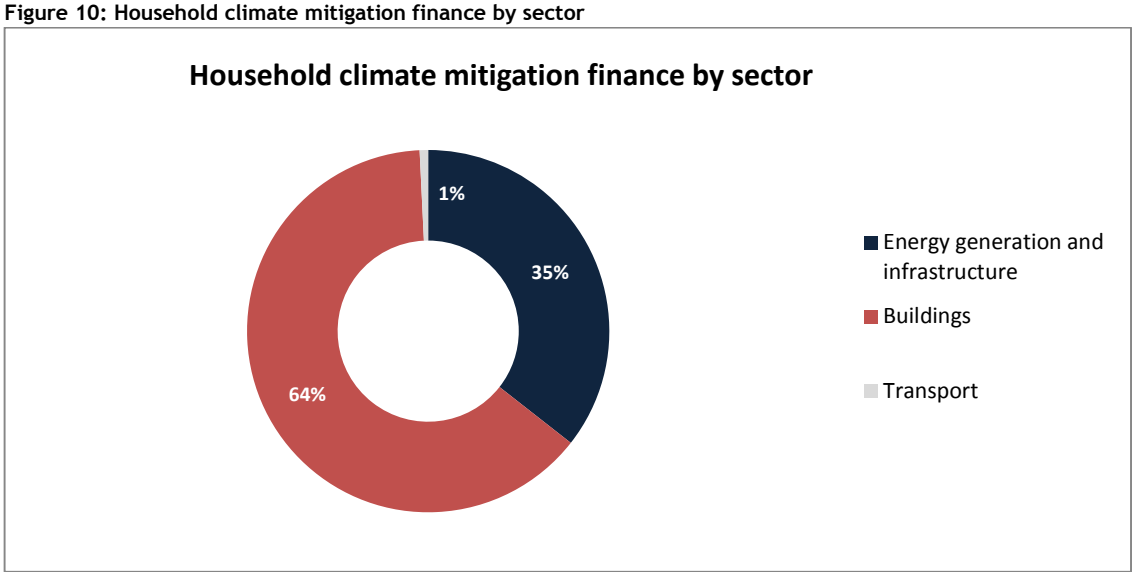


3.2.2 *Household finance*

Household climate finance is the other private contributor to the national climate finance. With **EUR 1,2 billion**, household finance contributes 19% of total climate finance. Household climate activities are limited to mitigation investments. Capital investments in energy generation (small-scale renewable energy and CHP installations and residential heating pumps and solar thermal) amount to **EUR 430 million** or 35% of total climate finance by households. Incremental energy efficiency investments in

buildings (energy efficient major domestic appliances, retrofitting and constructing) amount to **EUR 770 million,** which is more than half (64%) of total residential climate finance. For the transport sector, households invested **EUR 1,85 million (1%)** in electric vehicles.

Figure 10: Household climate mitigation finance by sector



3.2.3 *Public budgets finance*

NATIONAL PUBLIC BUDGETS

National Public budgets finance is not limited to supporting the private climate finance of corporations and households. Public governments, public agencies and (semi-)public/private organisations entrusted with a public assignment and operating in a regulated market (e.g. public transport companies, inland waterway operators and energy infrastructure operators) also contribute to climate finance by investing in infrastructure and energy efficiency measures. Public climate finance contributing to climate mitigation activities amounts to **EUR 1,9 billion**, which is 93% of total climate finance by national public budgets. Public climate services amount to **EUR 77 million** and climate adaptation amounts to **EUR 45 million.**

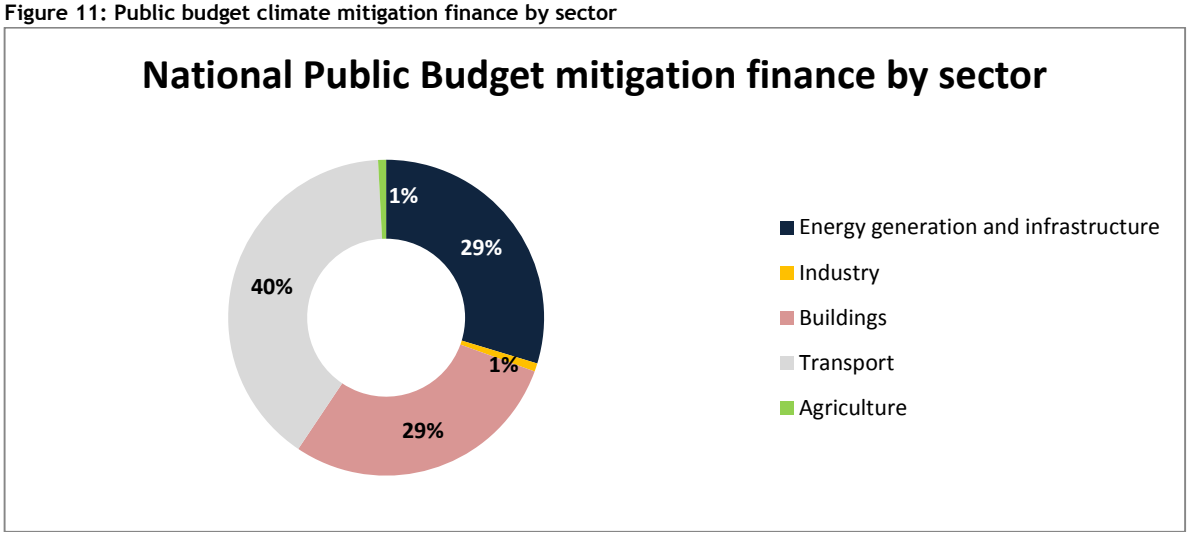
Public climate mitigation activities are both public government supporting activities for private climate finance by ministries / agencies and public investments by (semi-)public/private organisations. The public climate finance in the transport sector amounts to **EUR 755 million.** Most of transport climate finance are investments made to support a modal shift by the public transport operators (both railway and urban transport). The public finance in the buildings sector amounts to **EUR 547 million**, being mostly public support to energy efficient retrofitting by grants and tax reduction programs. A minor share is also used for energy efficient retrofitting of buildings owned by public organisations, though only the retrofits supported by grants and of the Flemish social residential houses are included.

The public finance in the Energy generation and infrastructure sector amounts to **EUR 562 million**. Public support are mostly grants and tax reduction for sustainable energy generation. Public (incremental) investments are made by the energy transmission operators and distribution net operators. Investments are made to cope with the increasing share of decentralised renewable electricity production and to extend the connectivity of the natural gas net for consumers. Regarding

industry and agriculture, the public climate finance is limited to supporting private energy efficiency investments. These are mostly grants to finance the incremental cost of more efficient and less polluting technologies.

Carbon offset finance is estimated to be **EUR 26 million** for national public budgets, and is considered as an outflow.

Figure 11: Public budget climate mitigation finance by sector



3.2.4 *European Contribution*

The EU contribution to national climate finance is limited to **EUR 120 million**, which is mostly concessionary loans for offshore wind farms and the contribution to national partners within European climate service projects (FP7, LIFE+ and ERDF).

3.3 The role of financial intermediaries and instruments

3.3.1 *The role of (financial) intermediaries*

The role of financial intermediaries (under which we understand public and commercial banks) is much less relevant in Belgium than in other European countries with important public banks taking up a key role in climate finance (for example KfW in Germany). As such, the use of concessionary loans is very low as only the international public banks (not the commercial banks) such as the European Investment Bank, are using it when providing loans to climate related Belgian projects. And as we don't have a real 'state bank' in Belgium (Belfius became officially a state bank after the financial crisis in 2011 but for a limited time), the term 'state bank' does not appear in the diagram (but is a part of public banks). The Walloon region and the Brussels region grant 'green loans' through participation with semi-public institutions (SWCS and Credal), referred to as 'public banks' in the diagram. The regional government agencies are considered to support the green loans with zero interest-rate financing.

Contrasting with Germany for example, is that in Belgium, the biggest part of the total climate investments is not going through financial intermediaries but is directly invested by corporates and households[52]. The second biggest intermediary is the public sector (excl. public banks) - i.e. ministries,

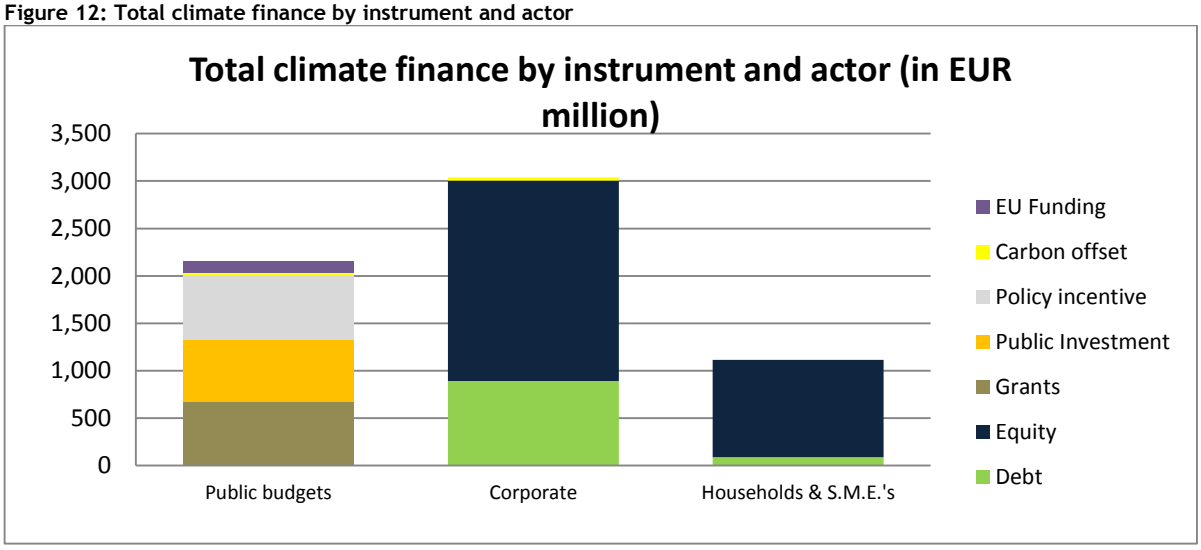
[52] This is deducted from the diagram, thus based on figures from all sectors.

public agencies & organisations - with **EUR 2.043** million. In third place (with **EUR 979 million**) we have the capital markets which provide the corporate and residential actors with funding (mainly loans).

3.3.2 *Instruments*

Instruments reflect the financial means used for supporting climate projects and measures. The use of a particular instrument varies across sectors and investors. The majority of Belgian investments in the energy and infrastructure, industry, and buildings sectors were made through equity and loan programs for households and companies. Debt (provided by commercial banks) and equity are by far the most used instruments to finance investments in climate projects (64% of the total). Bond and share financing, which are primarily used for large-scale projects, played a minor role. Concessionary loans only accounted for 3% of the total amount of used instruments (which is drastically different in Germany where these account for 44% of the total amount of instruments). And finally, public bodies (excluding the EU) did channel **EUR 2.043 million** to different kinds of climate projects by using public investments, policy incentives and grants. As these instruments are, from a public perspective, the most interesting, they will be elaborated a bit more in-depth.

Figure 12: Total climate finance by instrument and actor



Public investments

Public investments in climate projects are projects where public authorities invest with the aim of reducing CO_2 emissions. Public investments in energy infrastructure are done by the distribution system operators (DSOs) and Elia (the TSO) in relation to the integration of the deployment of renewable energy. We also included the climate related investments of DSOs in the gas distribution net. Public investments related to modal shift and sustainable transport for public transport are done by the regional public transport agencies (MIVB, De Lijn and TEC) and the national railway companies (NMBS group and Infrabel). Public investments related to modal shift through inland waterway connectivity and infrastructure are done by the Brussels and Walloon government and the Flemish inland waterway operators (NV De Scheepvaart and Waterwegen & Zeekanaal NV). Other typical public investments are the ones in Energy Efficient Street lighting and the replacement of mercury vapour lamps, energy efficient retrofitting of public buildings (supported by REU grants) and adaptation projects to make a city or region water resilient. Public investments in climate projects totalled **EUR 658 million** in 2013.

Policy incentives

Policy incentives differ from public investments as these instruments support people to invest in climate projects by using mainly fiscal incentives. Well known policy incentives are tax reductions for energy efficiency or energy reduction investments or for investments in electric vehicles and charging stations. These incentives can be federal or regional. The amount of the incentives rose **to EUR 674 million** in 2013.

Grants

Grants or subsidies are commonly used to trigger investments especially in energy efficiency and renewable energy technologies. Belgium is today one of the rare countries in Europe that sticks with green certifications policies to promote their renewable energy investments (cf supra: the energy section). In addition to the grants for RES, there are also many grants for investments in energy efficiency, especially in the built environment. Well known grants here are the Flemish Ecology Grant and the EE grants for insulation from the regional and local authorities. The amount of grants provided to climate projects was **EUR 671 million** in 2013 (incl. EU grants).

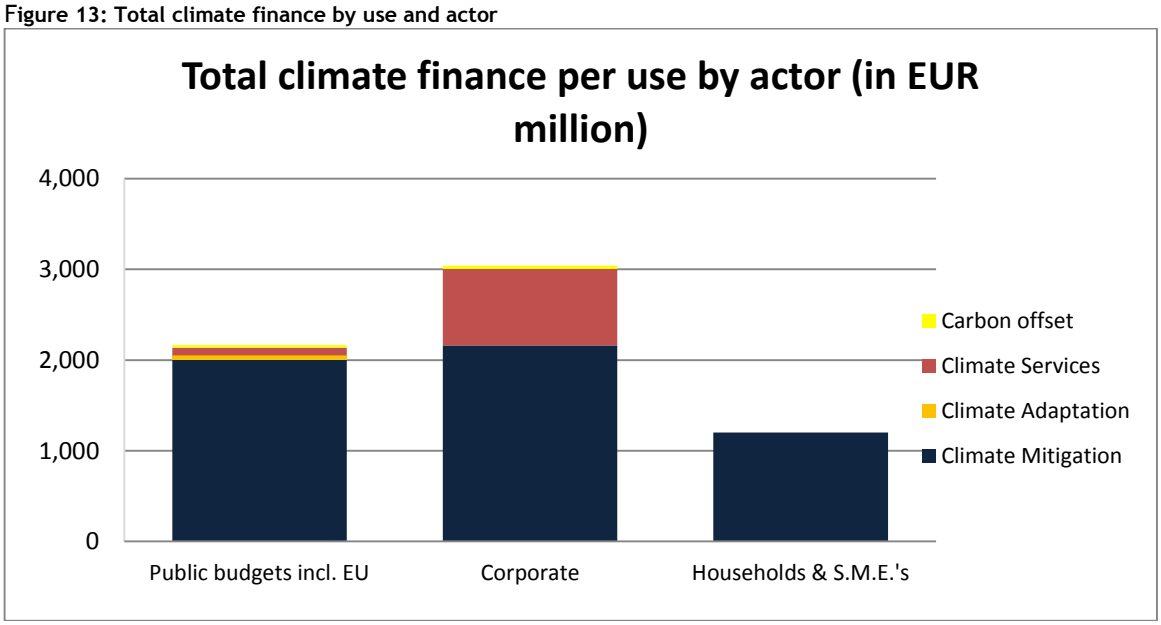
3.4 What is climate finance in Belgium used for?

The climate diagram identifies four different uses for climate finance: climate mitigation, climate services and climate adaptation and carbon offset (outflow).

Climate finance flows mostly to climate mitigation (84%) and climate services (15%). Climate adaptation investments in 2013 are limited as the climate adaptation plans of the different regions and the federal level were in the process of adoption (see section 2.2. – Climate Adaptation). The amount of climate adaptation finance will increase with the adoption of the federal and regional adaptation plans.

Climate services related to climate adaptation amounted to EUR 258 million in 2013. The total climate adaptation activities (investments and services) are about 5% of the total climate finance. Carbon offset is limited to EUR 60 million (< 1%).

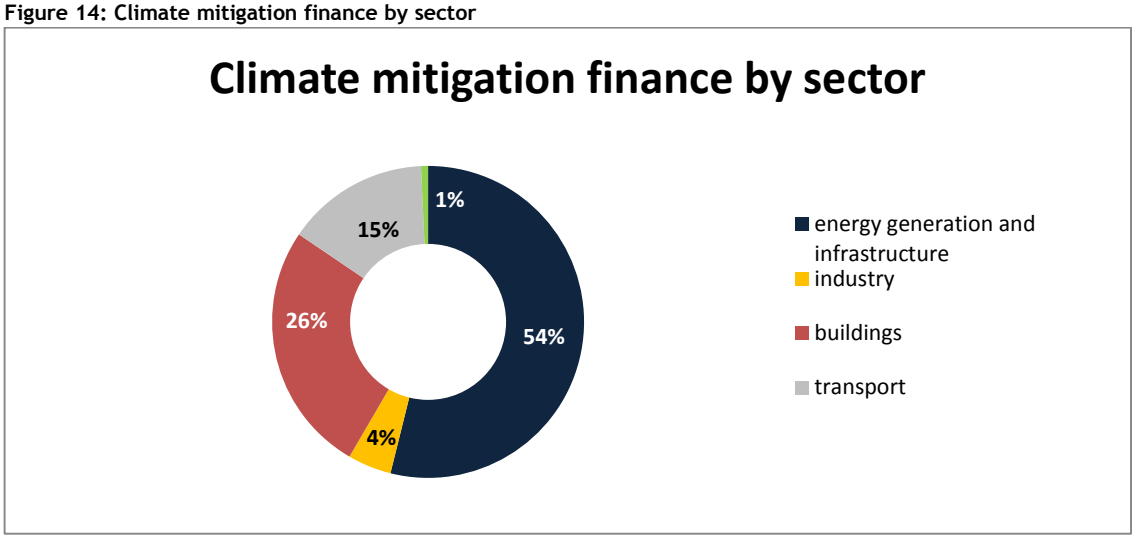
Figure 13: Total climate finance by use and actor



3.4.1 Climate mitigation

The total national climate mitigation finance amounts to **EUR 5,4 billion** or 84% of total climate finance. The climate mitigation activities are split in 5 sectors as shown in the figure.below.

Figure 14: Climate mitigation finance by sector



Energy generation and infrastructure, industry and buildings amount to EUR 4,5 billion, which is 84% of total climate mitigation finance.

The **energy generation and infrastructure investments** are mainly (capital) investments in renewable energy generation and CHP (92%) with investments funded by both public and private actors. The energy infrastructure investments (8%) are funded by (semi-)public organisations and are considered to be incremental costs to facilitate decentralised renewable energy generation and increase connectivity of natural gas for (domestic) heating.

Climate mitigation activities in the **industry sector** are mainly energy efficiency investments to reduce energy consumption. A share of these investments is made in the context of the voluntary branch agreements. The investments made by corporations are supported by the public grants and other supporting instruments (e.g. energy audits), which are different in the regions. The total climate mitigation investments in the industry sector **amount to EUR 243 million**. Neither public (EUR 26 million) nor corporate carbon offset finance (EUR 34 million) related to the EU ETS are included in the climate mitigation activities as they are not considered a low-carbon investment in Belgium but as an outflow related to the EU's emission trading programme.

Climate mitigation activities in **the buildings sector amount to 1.400 million and** are mainly energy efficient retrofitting. Capital investments and incremental costs related to energy efficient retrofitting amount to more than 80% of the total energy efficiency investments in buildings and 53% of total investments in the buildings sector (including capital investments in thermal and electrical renewable energy). Energy efficient retrofitting was stimulated strongly in 2013 with both federal and regional government support, though it should be mentioned that the federal support will decrease over time as support of energy reduction measures (except roof insulation) are discontinued since 2013.

Climate mitigation investments in the **transport sector amount to 794 million** and are mainly related to modal shift. Most investments are used for freight transport & inter-urban transport (93%). These investments are mainly funded by (semi-)public organisations to increase connectivity, fleet capacity and fleet sustainability.

In **agriculture**, CO_2 emissions related to energy consumption are only a minor part of the total GHG emissions. Agricultural activities (enteric fermentation, manure management and agricultural soils) are important sources of GHG emissions (CO_2, NH_4 and N_20). This is the reason why climate mitigation activities are not limited to investments in energy efficiency but also low-emission infrastructure and manure management are included. Given the fact that no comprehensive data is available for climate mitigation activities in Belgium, the total amount of investments are estimated based on the investments supported by the Flemish Ecology Grant Plus and an extrapolation for the Walloon government based on the differences in amount of agricultural companies, activities (livestock versus crop production) and farming land area (ha) between Flemish and Walloon farming. The total investment amounts to **EUR 39 million**.

3.4.2 Climate services

Climate services amount to **15% of total national climate finance.** National climate services include the participation in international R&D projects funded by the EU and with contribution of both national public and private actors. Most climate services are corporate services such as consultancy, energy management, climate adaptation & resilience and carbon finance (91%). A minor share are public contributions, related to both EU programmes and national/regional R&D programmes (9%).

3.4.3 Climate adaptation

As already discussed, climate adaptation investments in 2013 are limited, based on the development process of the federal and regional adaptation plans. Climate adaptation activities in 2013 are public investments in water management and flood control by the Flemish waterway operators. The total climate adaptation investments in 2013 amounted to EUR 45 million. The scope of climate adaptation activities is narrow (only flood control was considered in 2013) and climate adaptation action plans are still being adopted by the different regions. This explains the limited amount of investments in 2013. Activities related to increasing local resilience to climate impacts and preparing for changing climate hazards are mostly situated in the *readiness phase* (R&D and consultancy) rather than actual implementations. This is reflected in the amount of climate services (see above) related to climate adaptation (R&D, engineering and consultancy activities): the total climate service sales related to climate adaptation are estimated EUR 425 million sales and the related cost **EUR 258 million** in 2013. Climate services will leverage further climate adaptation investments.

3.4.4 Carbon Offset Finance

The EIB defines carbon offset finance as: "the general term applied to resources provided to a project to acquire appropriately certified greenhouse gas (GHG) emission reductions"[53]. The cost of buying CO2 allowances related to the EU ETS program are considered as Carbon Offset Finance. The cost related to the gap between free allowances and surrendered allowances amounts to **EUR 34 million** in the industry sector. The Federal and regional governments also bought CO2 allowances, amounting to **EUR 26 million** of public carbon offset finance. Carbon Offset Finance is considered as outflow, since the

[53] EIB. (n.d.). The EIB and Carbon Finance FAQ's. Retrieved from: http://www.eib.org/attachments/eib_and_carbon_finance_faq.pdf

financial means for the EU emission trading programme have not been invested in low-carbon measures in Belgium.

4 Public Finance Instruments

4.1 Introduction

The aim of this chapter is to give an overview of 'public finance instruments' which focus on other barriers than helping low carbon investments achieving a minimum yield. The instruments we are looking for should for example lower the transactions costs or limit the risk of default (by standardising products or by ascribing public guarantees).
In the first section, we will look at Belgian low carbon instruments taking into account the above. In the second section, we will look at best practices of these kind of instruments implemented in other member states (but able to be introduced in Belgium).

As a general introduction, we first give a short overview of the main public finance instruments that trigger private investments in climate specific and climate related investments in Belgium. These are:

- At EU level, there are grants for R&D activities (via FP7, Horizon 2020, etc.), loans or grants for investments in large electricity and gas grid infrastructure projects of common interest (via e.g. Connecting Europe Facility) and loans for investments in low carbon energy generation (e.g. EIB for offshore wind parks). The EU ETS scheme can also be considered as a public instrument which indirectly contributes to financing low carbon investments.
- At federal level, there are specific support measures for R&D activities, grants via federal research programs, corporate tax deduction for R&D expenses and reduced social contribution level on R&D related salaries. Corporate investments in renewable energy and energy efficiency projects are supported by a corporate tax deduction scheme (13,5 % in 2013). Investments in offshore wind energy can also benefit from a financial support scheme (green certificates).
- At regional level there are investments in renewable energy and combined heat and power supported via a certificate scheme. Industrial companies that have concluded a covenant, benefit from an energy tax reduction. Households and SMEs are eligible for grants for their energy efficiency investments (e.g. roof insulation).

These instruments facilitate the access to capital, mitigate the investor risks, reduce the financial (assets) or research (R&D) cost, and therefore leverage private climate investments. However, given the aim of this chapter – as indicated above – we will only describe a limited number of 'indirect financial' instruments which do not focus on the direct profitability of the low carbon investments but rather focus on stimulating indirectly the investments (and as such we will not discuss feed-in or green certificate systems, subsidies, grants, green tax reductions, etc.).

4.2 Belgian public 'finance' instruments

In this section, we will look at the usefulness of energy audits, standardization and certificates, the necessary regulatory framework, risk reduction, access to finance and green loans. The described instruments are often related to energy efficiency in the built environment as most instruments are developed for this sector (with the highest energy savings potential). Other instruments like energy plans, audits and covenants do also refer to energy efficiency in the industry. Instruments related to the transport sector (such as modal shift) are already explained in the section 'other policy recommendations'. This list of public 'finance' instruments is not exhaustive.

For each of the selected instruments, we briefly describe the success factors and for some, the barriers.

4.2.1 Energy audits

Strictly speaking, energy audits are not a public finance instrument. However, we mention it here as they are often the starting point of future energy efficiency investments. As such, they are a key instrument to leverage private energy efficiency investments and to increase the share of exploited energy saving potential. Without energy audits, the absence of insight in the technical and financial aspects of energy reduction measures creates risk and uncertainty related to high upfront investments and/or uncertain payback cash flows. Also, many measures stay unidentified if no energy experts are consulted. A recent German study illustrates that there is a significant increase in the adoption rate of energy efficiency measures after energy audits[54].

In Belgium, regional governments implemented both voluntary and obligated energy audits. Flanders, Wallonia and Brussels support voluntary energy audits and the resulting investments for households and corporate actors. Furthermore, an ERDF project 'Efficient Energy Use in SMEs' (2008-2013) in Flanders offered SMEs a free basic scan, followed by thematic recommendations of possible investments (50% subsidised). The evaluation of the thematic recommendations shows that almost 80% of the suggested measures will be implemented, which amounts to EUR 7,6 million of private investments. The investments initiated by this program were in general quick-win measures (related to compressed air production and re-commissioning of HVAC installations) with a payback period of less than 5 years[55] (see table below). In Flanders and the Walloon region, industrial companies participating in the sector agreements are stimulated to perform an energy audit. In the Walloon 'les accords de branche', companies are financially supported if they perform an energy audit.

Besides the voluntary energy audits, obligatory energy audits are also implemented in the Flemish region, such as the Flemish Energy-plan for installations (new and existing) with an annual energy consumption of at least 0,1PJ. Economically viable energy saving measures that are included in the energy plan must be carried out within three years. By 5 December 2015, the European Energy Directive (EED art. 8) obligates its Member States to ensure that all enterprises (excluding SMEs) undergo an energy audit every four years. In Brussels, an energy audit is an obligation for 'large consumers' for obtaining the environmental permit. Large users are identified based on their energy consumption per m^2 for offices, super markets, commercial buildings, hospitals, hotels, etc.

The mix of voluntary energy audits for small and medium energy consumers (households and corporates) and obligated energy audits for large energy consumers should be supported strongly. Energy audits are already supported with grants. The investments leveraged by energy audits are not tracked systematically yet, even in the Flemish Audit Covenant, where participating companies are obligated to implement and report the effective implementation of every energy saving with an IRR > 15%. A follow-up of the implementation of the energy efficiency measures, related investments and the leveraged energy reductions after energy audits should be considered. Investing in energy efficiency measures with a payback period longer than 5 years should be stimulated, this could be done by making subsidies progressive or relating the amount of support for energy audits on the effective implementation of long term investments.

[54] Schleich et al., 2015. *Effect of energy audits on the adoption of energy efficiency measures*. Retrieved from: http://www.webmeets.com/files/papers/eaere/2015/928/EAERE_2015_Schleich_Fleiter_Hirzel.pdf
[55] Agentschap Ondernemen. 2013. *REG in KMO's - Eindrapport*; Retrieved from: http://www.agentschapondernemen.be/content/reg-kmos-eindrapport.

Another important factor is the quality of the energy audits, which depends on the (constant) education of the auditors and the available audit tools. Although energy audit certificates are distributed by approved organisations, there is no follow up of the quality of the audits or auditors yet. VITO publishes a list with energy experts, but it does not guarantee that the energy expert concerned will be accepted by the competent authority under the existing regulations. Although in Wallonia, there is a list of certificated auditors allowed to perform audits for the AMURE-program[56].

[56] Wallonie DGO4.2015. Liste des auditeurs agréés AMURE. Retrieved from: http://energie.wallonie.be/fr/liste-des-auditeurs-agrees-amure.html?IDC=7790

Table 2: Supporting energy audits to identify the most (cost) effective energy efficiency measures and decrease the risks related to the investments

Name of the instrument	Region	Status	Type of instrument	% or amount	Voluntary / Obligatory	Source	Targeted sector / segment	Success Ratio
Auditcovenant Benchmarkcovenant (2005-2014)	Flanders	Replaced by similar program: EBO	Energy audit and	Linked to 'Ecologie Premie' and 'Strategische Ecologie Premie' for implementation of measures	Voluntary	Flemish government, VBBV	Industry	1,7 % Energy reduction on yearly basis of target group (IRR > 15%)
REG in KMO's	Flanders	2008-2013	Energy scan & thematic advice	50% subsidised of scan	Voluntary	ERDF	SME	80 % of measures with (IRR > 15%)
KMO Portefeuille	Flanders	Ongoing	(Strategic) Energy advice	50% with a maximum of EUR 2.500 (energy advice) OR 50-75% with a maximum of EUR 25.000 (strategic energy advice)	Voluntary	Flemish government	SME	
Energy audits AMURE	Wallonia	Ongoing	Energy audit	50 % for all participants, 75% for participants participating in Accords de Branche (max. EUR 4.000)	Voluntary	Walloon Government	Residential, Tertiary and Industry	
Les Accords de Branche	Wallonia	Ongoing , second phase	Energy audit		Voluntary	Walloon government, SPW	Industry	1,8 % Energy reduction on yearly basis of target group
Energie audit	Brussels	Ongoing	Energy audit	50% with a maximum of EUR 3.000	Voluntary	BIM	Residential, Tertiary and Industry	
Energy Plan (existing) & Energy study (new)	Flanders	Ongoing	Energy Plan & Energy Study		Obligatory	Flanders Government, VEA	Industry, Primary Energy use > 0,1 PJ	
Obligated energy audit for 'large consumers'	Brussels	Ongoing	Obligated for environmental permit	See above (Energie audit Brussels)	Obligatory	BIM	Large consumers (non-residential	

4.2.2 *Standardization and certification schemes*

Creating standardized and obligated energy performance labelling for buildings and electric appliances stimulates decision-making based on energy performance and makes comparing these applications easier and more comprehensive for non-energy experts. It also increases the overall awareness of energy efficiency and stimulates manufacturers and project developers to increase the energy efficiency of their products and projects.

The existing energy performance labels for buildings (Energy Performance Certificates and the EPB's E-level) and electrical appliances (energy labels) are implemented in Belgium in compliance with art. 11 of the Energy Performance of Buildings Directive and the European Eco-design Directive. Recently, there have been some concerns about the quality of the EPC certificates[57], which undermines the reliability of these certificates. High-quality training, better communication and follow-up of the energy experts are crucial to guarantee the quality of such certificates.

The table below gives an overview of the leading voluntary schemes in Belgium. All these schemes are neither obligated nor stimulated and have as such a slower implementation rate. BREEAM is 'the world's leading sustainability assessment method for master planning project, infrastructure and buildings'[58].

Table 3: Overview of the leading certification schemes in Belgium and their market share

Country	BREEAM		LEED		HQE	
	Retrofit and New Build	Existing Stock	Retrofit and New Build	Existing Stock	Retrofit and New Build	Existing Stock
Belgium	39	72	2		5	

Source: Trinomics, Market study for a voluntary common European Union certification scheme for the energy performance of non-residential buildings (2014, DG ENER)

Success factors

The key success factors for the introduction of an energy certification scheme are[59]:

- Ensure that the energy rating scale is properly representative across the building stock, and leaves sufficient room at the good end of the scale to motivate the industry to improve building specifications in the future.
- Require the certificates to include information on potential actions to improve the energy efficiency of the building the certificate is issued for, and if possible on the cost-effectiveness of these actions. The certificate should also specify whether the actions should be implemented in connection with usual renovation (e.g. of the walls, the roof, the windows, or the heating and cooling system) or can be implemented independently from usual renovation.
- Encourage building owners to present the energy performance rating of the building or, where space allows, the certificate itself whenever a building is advertised for sale or rent. Building owners should also be encouraged to show and hand over the certificate to potential buyers or tenants without the latter needing to request it.
- Publish the energy performance ratings achieved by all buildings in a database or register.
- Provide sufficient communication to the public and to building industry stakeholders, as well as training, certification and assessment tools for assessors who will issue the certificates.

[57] Mondelaers, T., 2015. *EPC nog verre van eenduidig*. Retrieved from: http://www.livios.be/nl/bouwen-verbouwen-of-kopen/bouwpartners/energiedeskundige/epc-nog-verre-van-eenduidig/
[58] BREEAM. (n.d.). Website BREEAM. Retrieved from: http://www.breeam.com/
[59] Trinomics (for DG ENER), 2014, Market study for a voluntary common European Union certification scheme for the energy performance of non-residential buildings.

4.2.3 A regulatory framework for LT investments in energy efficiency and renewable energy

According to the OECD[60], a new regulatory framework which is friendlier for long-term investments should be adopted at national, regional and global level. Stable and transparent regulations and policies are important to stimulate long-term investments. According to the Economist Intelligence Unit[61], Belgium ranks 17th in the global Business Environment Rankings, which is based on political stability and transparency, economic stability and financial availability. Although this is a rather good result, it is below our neighbouring countries Germany (12th) and the Netherlands (16th).

In Flanders, the Flemish government creates a stable regulatory framework for companies participating in the sector agreements (until 2014 the audit and benchmark covenant, since 2015 the Energy Management Agreement, EBO) by ensuring that no additional regulations or measures concerning energy efficiency or CO_2-reduction will be deployed. The participating companies are obligated to perform an energy audit every four years, to develop an energy plan, to implement an energy management system (e.g. ISO 50001) and implement all economically viable energy-saving measures. Although this is a good example of creating a stable investing environment, the overall Belgian political framework shows more instability with no integral approach between public support at regional level and federal level. For example, some measures are supported at both levels, with no framework for tracking or evaluating the implementation of regional/federal support and policies at national level, reporting of the implementation of the European directives (EED, RED) is more an aggregation of the separate implementation plans rather than an integrated plan and evaluation. There is also often insecurity about the continuation of existing instruments (e.g. the notional interest deduction). A stable political framework is also important for investments in renewable energy. According to ODE, the Flemish organisation for sustainable energy, the constantly delayed withdrawal of nuclear energy slows down the investments in renewable energy[62].

Another important barrier of the regulatory framework in Belgium (also based on previous work for provincial development agencies) are the long and complicated licensing processes for large RES projects, caused by the complex sub-optimally organised urban planning in Belgium. Project are also often delayed by protest of locals and environmental organizations.

Success Factors

The Flemish Audit and Benchmark Covenant and the Walloon 'Accords De Branche' cover both 85% of the primary energy consumption in both regions. This gives a good indication of the need in the industry to have a stable regulatory framework. The average annual primary energy reduction in the three sector agreements ranges from 1%-1,5%, compared to the situation in 2005. The highest annual energy reduction is realised in the Audit Covenant (1,5% per year), while the Benchmark Covenant and Les Accords De Branche realised a little less than 1% reduction of their annual primary energy consumption. The Audit Covenant is the only sector agreement in which the implementation of investments with IRR > 15% should be reported by the participating companies.

[60] Bassanini, F., Reviglio, E., 2011. *Financial Stability, Fiscal Consolidation and Long-Term Investment after the Crisis.* Retrieved from: http://www.oecd.org/finance/financial-markets/48609330.pdf
[61] Economist Intelligence Unit, 2015. *Business Environment Rankings - Which country is best to do business in?.* Retrieved from: http://www.eiu.com/public/topical_report.aspx?campaignid=bizenviro2014
[62] Bode, B. 2015. *ODE bezorgd over impact levensduurverlenging Doel 1 en 2.* Retrieved from: http://www.bouwenwonen.net/nieuwbouw/duurzaambouwen/read.asp?id=38532&content=ODE-bezorgd-over-impact-levensduurverlenging-Doel-1-en-2

Barriers

Barriers joining the Sector agreements seems low, considering the high participation rate in both regions. In the Flemish region, the participation in one of the two sector agreements is based on the primary energy consumption, while this is not the case in the Walloon government. A possible barrier to joining one of the covenants is the yearly reporting obligation, which might be time consuming and the fact that companies are not prone to publish information that might be confidential (e.g. about the implemented investments) or sensitive to share with government or other actors in the industrial sector (e.g. completion). The Flemish region addressed these concerns by assigning the VBBV as an intermediary between the industrial companies and the government, collecting and verifying the individual reports but delivering only an aggregated report to the Flemish government.

4.2.4 Reducing the risk related to investments and increasing access to financing for energy efficiency and renewable energy

Since the global economic (banking) crisis and following EU crisis, the regulation framework for financial institutions (bank and insurance companies - BASEL III) changed to reduce further risk of institutional bankruptcies. Corporate organisations also became more risk-averse since the crisis. It became more difficult for corporate organisations to receive credits from financial institutions[63] [64]. Corporate organisations are searching for both new low-risk financing structures and access to financial resources. Public organisations can support corporate organisation by facilitating an environment in which the financial resources are accessible at a competitive cost[65]. An example of how public organisations can support corporate investments with new financial structures is the ESCO-fund for SMEs, which is being developed by the Flemish investment company PMV, commissioned by the Flemish Government. The purpose of the ESCO fund is to stimulate the ESCO market by creating a structure in which financial institutions invest in an overall ESCO fund. The risks are carried by the fund rather than on an individual project-level. The ESCO has the financial resources available at a competitive cost and the SME is guaranteed yearly energy savings.

The ESCO-fund shows that there are possibilities to support corporate investments by reducing risk and making capital more available, although most of these initiatives are still in a (pre)feasibility phase.

Success factors

Since the ESCO-fund for SMEs is still under development, the success can't be measured yet. Although, we can already confirm that next to the financial means, the investment fund will create a standardised framework and streamline the procurement process for energy services by providing standardized compliant framework contracts for standard EPC-implementation measures.

4.2.5 Concessionary loans as public finance instrument

Concessionary loans are loans that are extended on terms which are substantially more generous than market loans, bearing no interest or a below-market rate interest. Concessionary loans are granted by both national (semi)-public banks (e.g. SWCS and Credal) or international public banks (e.g. EIB). In most cases, public organisations & governments support the (nearly) zero interest-rate and/or provide the guarantee for the lender to leverage loans for high-risk investments at generous conditions.

[63] Harvard Business Review. 2015. *How to Live with Risk*. Retrieved from: https://hbr.org/2015/07/how-to-live-with-risks
[64] Guise et al., 2014, *Time Varying Risk Aversion*. Retrieved from: http://faculty.chicagobooth.edu/luigi.zingales/papers/research/Time_Varying_Risk_Aversion.pdf
[65] VBO, 2013. *Financiering van uw bedrijf - Praktische leidraad bij een duurzame strategie*. Retrieved from: http://vbo-feb.be/Global/Publicaties/Gratis%20downloads/Brochure%20financiering%20van%20bedrijven_NLlow.pdf'

The regional 'Green loans' is an important supporting scheme to support and finance EE investments. Initially, green loans were granted by the federal government, but this scheme has been reviewed in 2012 and since then only households with a very low income can make use of the interest-free loans of the Fund for Reduction of the Global Energy cost (FRGE), founded by the Federal Government. As the financial means of the FRGE are distributed to social households through local entities of the Public Centre of Social Welfare, we do not have information about the yearly granted loans. On regional level, the Brussels ministry IBGE and the Belgian cooperative Credal grant green loans with '0% annual interest rate'. In Wallonia, the SPW-DG04 grants green loans in cooperation with the Société Wallonne du Crédit social (SWCS) and the Fonds du Logement de Wallonie (FLW).

The IBGE and SPW are responsible for financing the 0% interest rate, while the social households need to repay their loan to the semi-public partners Credal, SWCS and FLW. The total EE loans in Wallonia and Brussels amount EUR 85,6 million, considering the engagements of SPW and the reported loans of BIM & Credal. The granted loans are considered to be household investments. The zero interest rate financing is considered as public support and is estimated, based on the reference rate of OLOs for the average duration of the green loans[66]. In Flanders, there are no (direct) green loans available. To compensate for the stopping of the Federal green loans, the amount of support of the RUE and renovation grants has been raised for double glazing and solar boilers.

The European Investment Bank (EIB) distributes project loans to support the transition to a low-carbon, environmental friendly and climate-resilient economy. EIB commits at least 25% of their lending portfolio to low-carbon and climate-resilient growth[67]. They provide two kinds of loans (project loans and intermediated loans) depending on the total investment cost form smaller projects.
For individual projects for which the total investment cost exceeds EUR 25 million. EIB provides project loans. These loans can cover up 50% of the total cost for both public and private sector promoters, but on average this share is about one-third. Project loans of EIB are often used in large scale RES-projects. The offshore wind farm Northwind (216 MW – EUR 851 million[68]) was supported with approximately **EUR 333 million** in between 2012-2014 of EIB project loans, which is approximately 40% of the total project cost.
For smaller projects (< EUR 25 million, SMEs), the EIB provides intermediated loans (credit lines) to SMEs through local, regional and national banks. In Belgium, Belfius, BNP Paribas Fortis, ING Belgium and KBC are recognized as partner banks.

Success factors

Green loans are meant to support low-income households. Social households often don't have the necessary means to invest in EE-measures and the private credit market is not prone to grant loans, as there are no payback guarantees. The green loans in the Walloon and Brussels region can be considered as a success, based on the fact that with low public support (the zero interest-rate finance) almost EUR 100 million of investments by social households are covered.
The EIB funding supports sustainable projects in over 160 countries. EIB loans act as a catalyst to mobilise private finance for climate action, encouraging others to match the long-term investment. In

[66] National Bank of Belgium. (2015). *Database Yield of Belgian government loans on the secondary market*. Retrieved from: https://stat.nbb.be/
[67] EIB. (n.d.). *We finance low-carbon growth and climate resilience*. Retrieved from: http://www.eib.org/projects/priorities/climate-action/index.htm
[68] 4COffshore. (n.d.). *Northwind project details*. Retrieved from: http://www.4coffshore.com/windfarms/northwind-belgium-be02.html

2013, the EIB supported climate actions globally with EUR 19 billion lending, of which EUR 17,8 billion was meant for climate mitigation projects and EUR 1,2 billion for adaptation and resilience projects[69]. The long-term project loans at favourable conditions are a key instrument to attract private investors, since they lower the financing cost, increase the debt capacity and provide risk sharing. EIB loans are in Belgium often used to finance RES projects, e.g. the more loan of EUR 250 million (40% of total investment) to finance a new offshore wind farm Nobelwind with a capacity of 165MW in 2015.

[69] EIB. (2014). Activity Report 2013. Retrieved from: http://www.eib.org/attachments/general/reports/ar2013en.pdf

Table 4: Concessionary loans as public finance instrument

Name of the instrument		Region	Status	Type of instrument	% or amount	Source / Channel	Targeted sector / segment	Success Ratio
FRGE		Federal	Ongoing	0% interest rate	% annual interest	Federal Government/ Public Centre of Social Welfare	Social households	NA
0% JKP		Brussels	Ongoing	0% interest rate	% annual interest	IBGE / Belgian Cooperative Credal	Residential sector, households	NA
Ecopack		Wallonia	Ongoing	0% interest rate	% annual interest	SPW grants /SCWS and FLW	Households	NA
EIB		Europe	Ongoing	Project loan & intermediated loan		EIB (project loans) / recognised local banks (intermediated loans)	Both public and private sector promotors (project loans) / SMEs (intermediated loans)	On average 40% of total investment (offshore wind projects)

4.2.6 Conclusions and recommendations

Energy audits performed by experts are a key instrument to leverage private energy efficiency investments and to increase the share of exploited energy saving potential. To monitor the effect of the instrument, a better follow-up of the implementation of the energy efficiency measures, related investments and the leveraged energy reductions after energy audits should be considered.
Next to a better monitoring, investments in energy efficiency measures with a payback period longer than 5 years should be stimulated. This could be done by making subsidies progressive or relating the amount of support for energy audits on the effective implementation of long term investments.
An important criterion for the success of this instrument is the quality of the audit. Although energy audit certificates are distributed by approved organisations, there is no follow up of the quality of the audits or auditors yet. This should be urgently done!

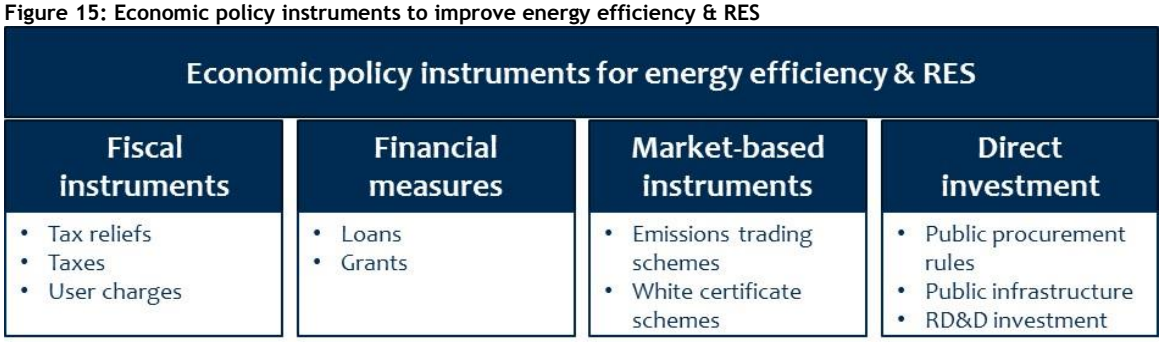
A stable and entrepreneur-friendly environment stimulates long-term investments in energy efficiency and renewable energy. The overall Belgian political framework shows instability and shows no integral approach between public support at regional level and federal level. There is no framework for tracking or evaluating the implementation of regional/federal support and policies at national level, reporting of the implementation of the European directives (EED, RES) is more an aggregation of the separate regional implementation plans rather than an integrated plan and evaluation. There is also insecurity about the continuation of existing instruments for stimulating the investments (e.g. the notional interest deduction). A thorough monitoring of the implementation and progress of the EED (RES is better done) will help to identify the gaps and how to deal with them. A stable framework and a one-stop-shop for RES-related investments should increase the appetite of investors and decrease the time to obtain the necessary permits.

Reducing the risk related to investments and increasing access to financing is important to stimulate the market. Public organisations can support corporate organisations by facilitating an environment in which the financial resources are accessible at a competitive cost. They can also mitigate barriers by giving access to expert knowledge and standardise procurement processes to eliminate administrative burdens, stimulates new markets and business models (e.g. EPC and ESCO contracts.)
'Green loans' are another important supporting scheme to support and finance EE investments in special target groups (e.g. social households). A public administration/body could - hand in hand with a group of financial institutions - work out the implementation of these green loans at a broader level.

4.3 Best practices from other member states

In the figure below, an overview is given of the most important economic policy instruments to improve energy efficiency in different sectors (most of these instruments do also apply for renewable energies).

Figure 15: Economic policy instruments to improve energy efficiency & RES

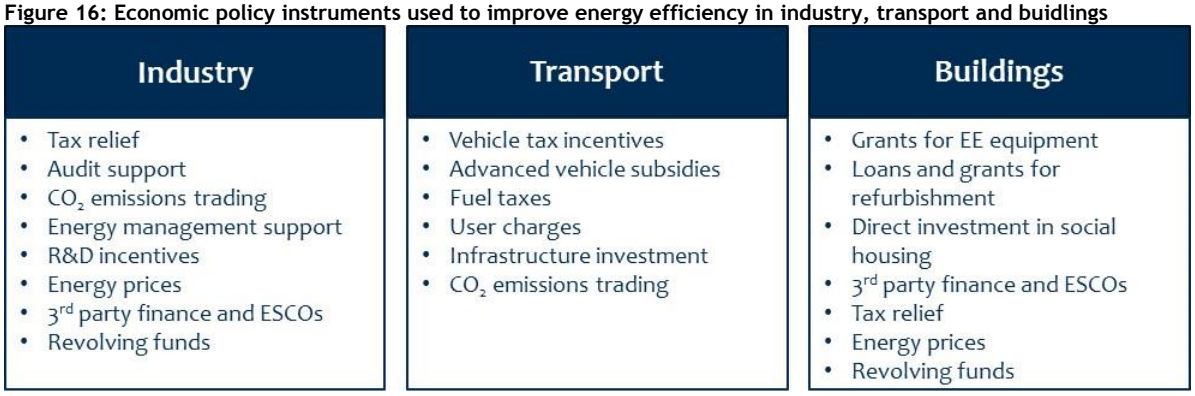


Source: IEA, The future of energy efficiency finance

Fiscal instruments, financial measures and market based instruments are used in most EU member states and are also commonly used in Belgium and its three regions. Direct investment policies refer here to 'public strategic investments' such as investments in infrastructure (smart meters and grids), investments in or subsidies for research and development and thirdly, public procurement rules. This last category refers to rules that will lead to the public purchase of higher (cost) energy-efficient products. The EU legislation on eco-design (which set more stringent energy performance standards for producers of appliances) has led to a whole range of higher energy-efficient appliances without too much market disturbance/opposition. It is a very good example that green public procurement rules can lead to an effective low carbon policy and increased investments due to increased demand (government spending is good for 54% of GDP – for 2013 and 2014).

The following figure shows the economic instruments used in energy efficiency policy for the sectors industry, transport and buildings (the three most energy intensive sectors).

Figure 16: Economic policy instruments used to improve energy efficiency in industry, transport and buidlings



Source: IEA, The future of energy efficiency finance

Overall, the most applied European financial instruments related to low carbon investments (thus basically supporting renewable energy and energy efficiency) are tax policies, grants and subsidies, CO2 trading, infrastructure investments, (preferential) loans, revolving funds, energy price policies and third party finance/energy performance contracting/ Energy Service Companies (ESCOs). Due to our

focus on specific indirect public finance instruments (cf. the introduction), we will only look at specific instruments/concepts with a minimum level of replicability. From the above list, we believe that (preferential) loans - incl. revolving funds - and Energy Performance Contracting (EPC) by using Energy Service Companies (ESCOs) together with energy savings obligations are the most promising instruments/concepts. The reason of this selection (of potentially hundreds of instruments) is that these instruments are rather innovative, do regroup a multitude of variants and are replicable in a Belgian context (given certain conditions). For each of these categories, we explain some best practices from another member state. These examples were selected (out of nearly 100 good practices) from a European study (done by Trinomics) on the identification of the best sustainable energy investment instruments at the local and regional Level.

4.3.1 *Energy Performance Contracting (EPC)*

ELENA - LONDON REFIT[70]

The purpose of RE:FIT is to assist public bodies in London to significantly reduce carbon emissions from their buildings, in line with London's target of cutting carbon emissions by 60% by 2025 (as set out in the mayors Climate Change and Mitigation Strategy[71]). The project utilises an Energy Performance Contracting approach alongside an associated procurement framework. This involves the public sector building owner identifying a portfolio of buildings that they want to retrofit with energy efficiency measures, setting a target percentage energy saving they would like to achieve and a payback period that they are comfortable with. Then one or more of the framework contractors bid to provide these energy savings within the desired project parameters. The winning bidder then carries out and guarantees the resulting energy saving retrofit measures. This guarantees the payback of the initial investment whilst also transferring the delivery risk to the Energy Supply Company (ESCO). This approach is attractive as it provides a cost neutral mechanism to reduce the carbon footprint of public buildings.

The project concept was developed from a pilot which was originally funded through the Greater London Authority (GLA). This pilot targeted 42 buildings with £7 million in investment. The pilot delivered investments that are due to payback within 7 years with the building owners able to benefit from savings of £1 million per year thereafter. This initial phase retrofitted a total area of 145,852 square metres of public buildings and is estimated to save >7,000 tonnes of CO_2 per annum.

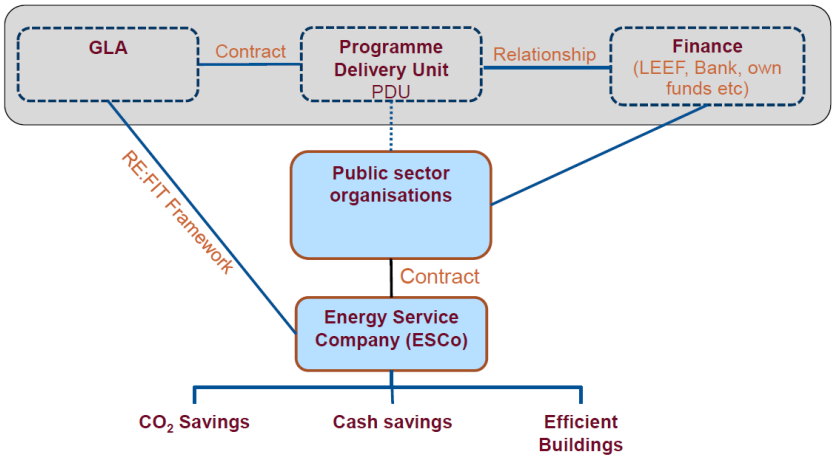
The delivery framework associated with the RE:FIT programme is a key enabling feature of the programme. The RE:FIT framework streamlines the procurement process for energy services by providing pre-negotiated, EU regulation compliant contracts that can be used with a group of pre-qualified Energy Services Companies (ESCOs) for the design and implementation of energy conservation measures. RE:FIT allows public sector building owners to procure and implement large scale retrofit programmes up to six times faster than if they were to undertake their own OJEU[72] process for public sector procurement.

The ESCO providers on the framework include the most important contractors: Balfour Beatty, COFELY, MITIE, EDF Energy, E.ON Sustainable Energy Business, Hoare Lea Consulting Engineers, Honeywell, Interserve, Johnson Controls, Schneider Electric and Wilmott Dixon Partnerships.

[70] http://refit.org.uk/
[71] http://www.london.gov.uk/who-runs-london/mayor/publication/climate-change-mitigation-energy-strategy
[72] Official Journal of the European Community; a European Union mandated procurement process.

The following diagram outlines how the RE:FIT programme is structured. It is essentially made up of three synergistic elements: the RE:FIT procurement framework (as set up by the GLA), the European Local Energy Assistance (ELENA – a programme funded by the EIB), the programme delivery unit and the financial element (funded through the London Energy Efficiency Fund (LEEF), Banks and public body reserves).

Figure 17: Outline of the RE:FIT programme



Source: Trinomics (for DG ENER), 2012, Identification of the Best Sustainable Energy Investment Instruments at the Local and Regional Level.

The London REFIT programme was developed with a range of different operational and financial models enabling the investments to be "on" or "off" the balance sheet. Making the investment off the balance sheet was seen as a complex option. The issues around ownership, liability and the assigning of risk could not be overcome. Additionally, the public sector, at the time of initial project development was simply not interested in this type of approach. However, the project is now entering a critical phase where they are looking to develop a second phase with a revised procurement framework for RE:FIT.

In terms of what could be done better, or changed in future, the importance of ambitious initial applications was noted as important. Public sector cautiousness means applicants with extensive building stocks may initially only apply for a small proportion of their buildings to be refurbished. However, on successful implementation of a few buildings they have returned (often within 12 months) to reapply. The process of reapplication is time consuming and expensive for all involved (the applicant, the funders and the programme delivery unit). In the future, a phased approach to renovations will be promoted, so that renovations can still be done at a speed comfortable to the public body involved, whilst also leaving the option open to future renovation phases, without the need to reapply to the scheme from scratch.

ESCO partners undertaking energy performance contracting requires an established baseline of information in order to estimate and guarantee what savings they will be able to generate for the public sector client. In the past this baseline energy information has not always existed and this has limited the number of buildings within which renovations could take place. Initial project experience has demonstrated this and there is now more active education of participating public organisations

regarding the importance of establishing a verifiable baseline of energy data. This is now demanded of potential applicants as the first step in the project cycle.

Originally the main barriers to these investments may have been technical capacity, lack of resources, procurement complexity and lack of financial instruments. Many of these have been overcome, but banks and the public sector's attitude to lending has hardened over recent times. This is likely to remain the main challenge to this project in the foreseeable future.

Berlin Energy Saving Partnership[73]

The Berlin Energy Saving Partnership was jointly developed by the Berlin Energy Agency (Berliner Energieagentur) and the Berlin's Senate Department for Urban Development in 1996. It's a model for achieving energy savings through Energy Performance Contracting (EPC), tapping into the potential for energy savings in a pool of buildings with different properties.
Examples of public buildings upgraded in the frame of the project in Berlin include town halls, schools, day nurseries etc. The Berlin Energy Agency acts as the independent project manager, who moderates and manages the process, e.g. the negotiations on the baseline and the contract, and puts the building pools out for contracting. The EPC contracts are implemented by private energy service providers, so called ESCOs (Energy Service Companies) which finance investments into energy savings. The ESCO is also responsible for the planning, implementation and management of the energy savings measures and bears all the operational and economic risk of the project. The ESCO recovers the investment cost through the resulting energy cost savings by the ESCO. Additional cost savings are shared between the ESCO and the building owner, thus both parties profit from the contract. In the frame of the project, public buildings are 'pooled' in a way that less profitable buildings can be combined with more profitable ones and transaction costs are thereby reduced.

For the building owners, the advantage of the model is that they do not bear any investment costs, can outsource the implementation of the energy saving measures, and realize energy cost savings.
Typical energy saving measures applied are insulation, CHP, efficient lighting, heating control systems, and energy consumption regulators.

Since 1996, within the Berlin Energy Saving Partnership, 26 energy partnerships were launched, comprising of more than 500 properties in Berlin which include more than 1,300 public buildings. The model has also been replicated in other regions of Germany and the project is ongoing.

Energy Performance Contracting as undertaken by the Berlin Energy Saving Partnership is a well replicable concept which can lead to significant energy cost savings in public buildings without the need to up-front capital investments by the involved public building owners. However, it does require a functioning market of ESCOs which have sufficient access to capital to bear the significant up-front investment costs.

(Dis)advantages and success criteria of the EPC business model

The EPC business model has the following main advantages:
Up-front capital investments by the involved building owners or property owners are not needed;

[73] http://www.berliner-e-agentur.de/en/consulting-information/energy-saving-partnerships-berlin.

The ESCO has professional knowledge regarding the technical requirements, installations and the (local) legislation regarding permits and (fiscal) support schemes;
It pushes forward energy efficiency improvements by professionals and most administrative and financial issues should not be dealt with by the building owner.

Yet, there are also some major disadvantages:

- There are few qualified ESCOs. They need to be large and credible to get sufficient access to capital from financial institutions. Few regions in Europe have a functioning ESCO market[74] [75];
- It is a complex set-up. It is therefore time consuming to establish such programmes and it requires (external) expertise[76]; there are also frequently legal limitations on commercial funding for municipalities, as well as rigid procurement and budgeting policies;
- Each project needs to be assessed individually to estimate potential savings; the technical baseline is often difficult to determine as building owners tend to have only limited availability of energy consumption data
- EPC is mainly suitable for large scale projects due to this complexity. The associated overhead costs are unlikely to be coverable on a single-household level[77];
- ESCOs tend to pluck only the low hanging fruit[78];
- An EPC typically only concerns an agreement on savings, not on the measures to be implemented. The ESCO's choice of measures may have non-energy impacts such as building appearance or living comfort.
- Within the administrative structure of the public sector, there tends to be a lack of political willingness, know-how, information and responsibility, which prevents public sector actors from pursuing EPC contracts for their buildings.

Taking these barriers into consideration, a number of criteria and conditions of success have been derived based on the experience of ongoing ESCO projects:

- There needs to be a driving force, i.e. decision makers who take the responsibility for initializing and supporting the programme;
- There needs to be a reliable legal framework, including clear information that public authorities are indeed allowed to enter into EPC contracts;
- Standardized procedures and contracts improve the time and cost effectiveness in the planning and implementation phase and contribute to the reliability of the programme;
- It is desirable to have a large enough ESCO market in order to allow for real competition among companies when bidding for EPC contracts.
- Neutral process management (as done by the Berliner Energieagentur) increases the trustworthiness of the programme. The neutral process manager can also function as a potential mediator in conflict situations. Process management should be done by an organization that has both technical as well as economic know-how regarding energy contracting;
- The building needs to be expected to be in existence (and similar use) for at least another 10 years;
- In order to be able to determine the energy baseline, there should have been a consistent development in energy consumption over the last few years;

[74] Mora Associates (2010). Energy Service Companies (ESCO): Monetization of energy efficiency. [Online] Wagner, L. Publication is available at: http://www.moraassociates.com/publications/1002%20ESCO.pdf.
[75] Berliner Energieagentur GmbH (2008). International Experiences with the Development of the ESCO Markets. [Online] Lamers, P., V. Kuhn and A. rechting.
[76] JRC, 2010, Energy Service Companies Market in Europe- Status Report 2010 -EUR 24516 EN – 2010.
[77] JRC, 2010, Energy Service Companies Market in Europe- Status Report 2010 -EUR 24516 EN – 2010.
[78] Milin, C., and Bullier, A., 2011, Energy Retrofitting of Social Housing through Energy Performance Contracts, A feedback from the FRESH project: France , Italy , United Kingdom and Bulgaria, in Energy (2011).

- The minimum project size needs to be met and it should be technically feasible to undertake interventions in the central heating system. If the building is rented out, there needs to be an approach to incentivize both landlord and tenant to take part in and support the EPC programme;
- Building owners require support during the start-up process, especially in negotiating the contract with the ESCO. In Berlin, the local government provides financial support of 50% of the project development costs. This support is critical as otherwise most building owners would not be willing to engage in the EPC project.

Replicability for Belgium?

In principle the RE:FIT model should also work in a Belgian context. The core pillars on Energy performance contracting, of **simplified procurement frameworks**, **guaranteed savings** and low cost finance are sound and also Belgium could fall back on Elena funding (or the newer EIB fund started up in 2015: the Private Finance for Energy Efficiency (PF4EE). Belgium (or one of its big cities) does not have yet an Energy Efficiency Fund (such as LEEF) and also the Belgian commercial banks have been risk averse when asked to step into ESCO funding. Setting up such a financial structure and lining up enough funding by involving the banking sector is key in such a set-up. Also the legal frame is important as there is currently no specific legal basis for ESCOs (and thus each time a different legal frame is set up between the different partners in an ESCO structure). This is one of the reasons why the number of ESCO-related Belgian projects are still rather limited (compared with for example Germany and Austria)[79].

The Berlin partnership has already been replicated in other regions in Germany and in Bulgaria, Slovenia, Romania and Chile. It was found that there can be problems related to a lack of clarity in the contract approval process. Therefore, involved government agencies and other actors need to very thoroughly communicate on the contract approval process in order to keep building owners engaged. When Belgium wants to implement a similar approach it should have a strong legal framework for tenders (know how is available). It is also recommended that local private firms carry out the implementation of the energy savings measures.

We could conclude that Energy Performance Contracting as undertaken by the Berlin Energy Saving Partnership or by the Great London Authority are both replicable concepts which can lead to significant energy cost savings in public buildings without the need to up-front capital investments by the involved public building owners. However, it does require a functioning market of ESCOs which have sufficient access to capital to bear the significant up-front investment costs tighter with a minimum legal frame. Both elements (besides the conditions mentioned above) should be developed for Belgium.

4.3.2 (Preferential) Loans

SUSTAINABILITY LOANS IN MUNICIPALITIES OF NL

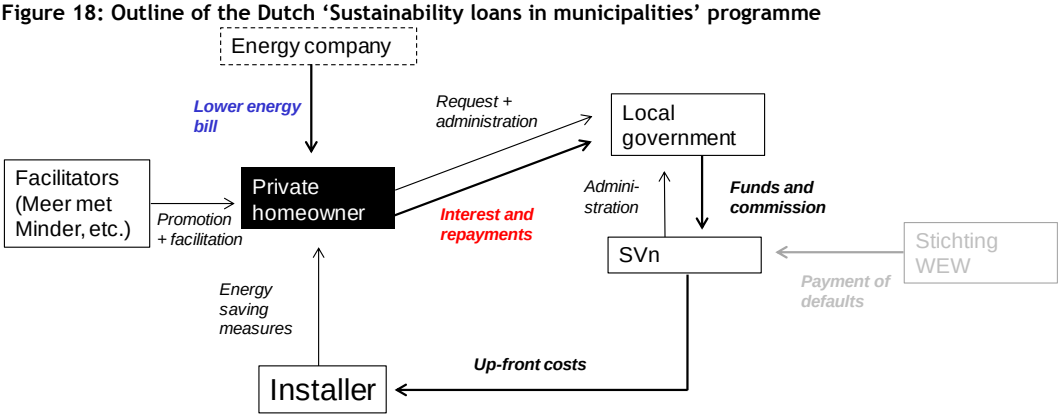
'Sustainability loans in municipalities' is a Dutch government programme executed by municipalities in the Netherlands, which can set up a fund to finance sustainability loans. These are preferential loans for private homeowners to realise energy improvements. The interest rate is the market interest rate (depending on the loan period) which is always deducted by 3%-points. As trusted creditors, municipalities pay lower interest rates for their loans than private homeowners. This allows them to pass on the following loans under favourable terms: the minimum loan is 2.500 Euros, and the maximum

[79] http://www.belesco.be/

loan is 15,000 Euros. Loan periods can be 10 years (below 7,500 Euros) or 15 years (above). A government organisation is used to back up these loans with a guarantee, minimising the risks for municipalities.

The main purpose is to save energy in privately owned dwellings. This follows ultimately from EU and (translated) national energy and climate change policy and targets. There is a large gap between the need for investments for the large saving potentials in the built environment, and available financing options, particularly, for private homeowners. Non-energy benefits do not have the focus, but these are for example increased comfort for the dwelling owner.

Figure 18: Outline of the Dutch 'Sustainability loans in municipalities' programme



Source: Trinomics (for DG ENER), 2012, Identification of the Best Sustainable Energy Investment Instruments at the Local and Regional Level.

Municipalities bear most of the costs and risks of the programme, which are the funds for the loans and commission to SVn that passes on its managing costs. Municipalities in turn earn the benefits from the instalments and interest received from homeowners. SVn is a foundation that only services its members, public sector organisations like municipalities and provinces. Furthermore, SVn owns permits to be engaged in financial services (offering financing, collecting payments) that are required by law, and has knowledge of assessing creditworthiness. These are reasons for the organisational structure as it is. To offer a sustainability loan, a municipality itself has two legal arrangements to make. First it should set up an agreement with SVn to settle the cooperation between both parties, and second it has to set up a subsidy regulation. SVn supports municipalities with both activities. The programme has not been created by national regulation.

Until December 2011, the guarantee regulation '*Garantieregeling Energiebesparingskrediet'* which was managed by Stichting WEW, offered guarantees to municipalities for the financing they offer. In this way municipalities run a lower risk and can ask lower interest rates. SVn, as provider of sustainability loans, had the right to claim for their municipalities a maximum of 1.5 million Euros from Stichting WEW for loans not repaid by homeowners. Municipalities will now have to cover the risks and possible costs of defaults themselves. This does not count for loans already provided, which will remain covered by the Stichting WEW. It depends on the willingness of the municipalities if they want to continue to offer, or start offering, the sustainability loan at a 3%-point interest rate reduction. The guarantee regulation by WEW was fully funded by the ministry of Internal Affairs. SVn regards the regulation as not really expensive to the government. As the risk of defaults are not high, expected costs (actual payments by WEW) were assumed to be limited.

SVn can manage to cover the costs of the administration of sustainability loans (it achieves positive financial results), which is its goal as a non-profit organisation. Furthermore, the risk of significant losses are probably small, as sustainability loans make up a small part of the total funds portfolio of SVn.The sustainability loans programme is hardly funded by European funds, except for a few examples (e.g. fund of the province of Drenthe). As municipalities provide the funding, they should take the initiative to attract such funds.

Analysis

Strengths:

- The sustainability loans are very attractive for private homeowners, because of the large interest deduction.
- The loans are not mortgages, but private loans. A mortgage would be more complex, as it requires a home and its saving measures to become collateral for the loan and administration costs and financing costs (from longer mortgage periods) would be higher. These drawbacks hold for private homeowners as well as for financers.
- The loans are provided by municipalities, who are already in contact with their inhabitants and are considered to have the required capacity (organisation, financial means). Potentially all municipalities together can have a large scale impact.
- The administration of the loans is done by a separate organisation (SVn). Administration required from homeowners and municipalities seems acceptable. For example, it is assumed most municipalities do not require homeowners to perform an extensive energy performance advice in order to get a loan. SVn indicates that energy performance advices are not favoured and even impose an additional barrier to homeowners, as it costs money and delivers a lot of hassle.

Weaknesses:

- An inevitable disadvantage of sustainable financing is the increased financial risk private homeowners take.
- Another important barrier seems to be the willingness and ability of municipalities to provide funding, for which no financial guarantees by the government are provided anymore.
- An issue at the start of the programme was the search for early adopters, the first municipalities willing to offer the loans. Also, the political, governmental and official process to get the programme in operations took quite some time.

Opportunities:

- The saving potential of the programme can be considered high. Potentially, all local governments (provided enough capacity at SVn) can offer sustainability loans, and every Dutch homeowner (provided their creditworthiness) can get this loan. Moreover, the sustainability loans are available for many common and cost effective saving measures and renewable options. The target segment primarily is existing dwellings with high saving potential. Furthermore, energy costs are expected to become a larger share of total living expenses, which keeps the need to lower energy use.
- The programme should be easily replicable in other countries, if municipalities are assumed to be able to make the legal arrangements and a foundation like SVn can be set up and funded (by private or public parties) according to the Dutch example.
- There is no on-bill financing construction available for the sustainability loan. SVn explored the option but experienced difficulties to realize this via energy companies. However, in the future this remains an opportunity.

Threats:

- The willingness of private homeowners and local governments is crucial for the impact the programme can have in terms of energy savings in the built environment. Up to 2011, only roughly 10% of all Dutch municipalities (50) offer sustainability loans. The most important barrier is that homeowners need to become aware of the sustainability loan. The loan has attractive conditions so

SVn hopes increased awareness will increase demand. Also more municipalities or provinces need to be willing to offer the loan, as this determines the reach of the policy programme.

- The lack of a stable energy policy of the central government is regarded a barrier. Stopping the guarantee regulation '*Garantie energiebesparingskrediet'* illustrates this. This seriously threatens the attractiveness and future demand for sustainability loans. The scale of the programme so far is modest (8.4m€), so the scheme has yet to prove its success. The chances of success have decreased considerably since the government withdrew their guarantee, taking away an important success factor. This is a pity, since **loans that are provided by municipalities often provide more confidence with house owners** than from a national public body.
- In case many more Dutch municipalities join the programme, the promotion and administrative tasks for SVn and other involved parties get much larger.
- A contemporary barrier is the low trust of consumers following the economic downturn.
- A possible threat is the lack of capacity in the market to meet the demand for energy savings in dwellings, in case the programme gets very successful. This for example may require much more installation companies offering energy services and materials, than currently available.

Replicability for Belgium

The financial conditions of the sustainability loans are rather favourable and make the loan attractive for households. Replicability to Belgium should be rather easy. The financial risk for the Belgian municipalities (given their financial situation) can be controlled when allowing the loans (but a minimum of financial reserves should be allocated). The way it is set-up in the Netherlands is efficient and effective and can be transposed in the same way in Belgium. One issue is that you best need a centrally managed body (a national foundation in the Netherlands); this could be either done by the Belgian government or buy the regional governments or by a financial agency. Willingness of homeowners and municipalities, mainly due to investment and financing risks, are the main barriers. This should be investigated and could be a role for the provinces or/and the municipalities.

KfW's Energy efficient Refurbishment Programme

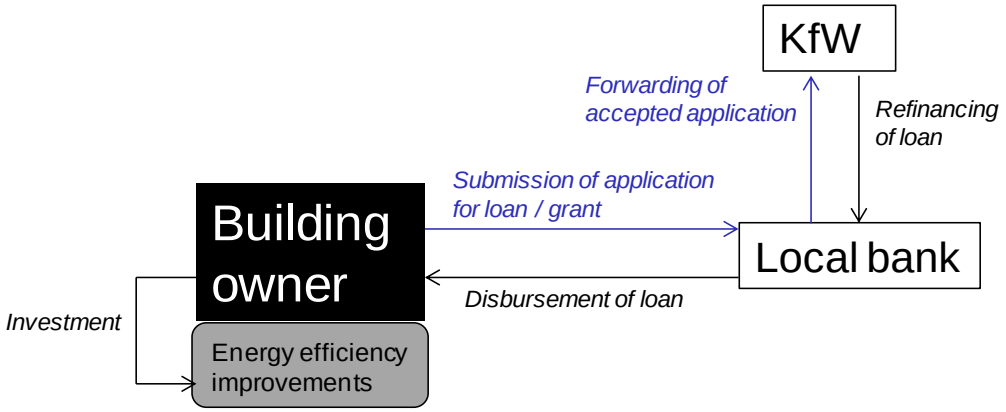
Energy use in buildings plays an important role in Germany's climate mitigation targets as about 40% of energy end-use and a third of CO_2 emissions are related to the built environment. As Germany's promotional bank, which was founded to support the reconstruction efforts after the Second World War, Kreditanstalt für Wiederaufbau (KfW) has grown into an important player in supporting Germany's efforts in this area. Between 2005 and 2008, KfW has for example been involved (for the most part in collaboration with local banks) in almost 80% of the investments into improving insulation in residential houses in Germany but is also very active in other sustainable energy investments (Klinckenberg Consultants, 2010). KfW's programmes are not separate efforts but part of and closely aligned with the broader strategy of the German government to improve energy performance. The KfW programmes "Energy-Efficient Refurbishment" for example directly build on the energy performance standards set by the German EnEV (Energy Conservation Ordinance), the programmes are supported by the German Energy Agency (DENA) with information campaigns and technical know-how, are financed by German tax revenues, and conditions are negotiated with the German government. Apart from climate goals, the programmes also have the explicit targets to create jobs and support economic growth.

KfW's earliest efforts in the area of energy efficient modernization of Germany's building stock date back to 1996 when the "KfW CO_2 Reduction Programme" was introduced. Compared to today's approach, this programme supported mostly individual measures or a package of measures rather than

taking a more comprehensive approach and started with a sole focus on the former West German states. Since then, there have been various adjustments to the approach, with the current version of the programme ongoing since 2010.

The "Energy- Efficient Refurbishment" programmes apply a mixture of soft loans and grants. The more efficient the house becomes after refurbishment, the less of the loan the building owner has to repay. Home owners who either want to invest to make an older residential building more energy-efficient or plan to purchase a newly refurbished home can apply for a KfW loan if the house after refurbishment does not exceed a specific energy requirement for a comparable new house. The respective energy standards for new houses are laid out in the German Energy Conservation Ordinance (Energiesparverordnung/EnEV). The level of support by the KfW programs depends on how the performance of the house compares with the energy requirements specified by the EnEV.

Figure 19: Outline of KfW's 'Energy-Efficient Refurbishment' programme



Source: Trinomics (for DG ENER), 2012, Identification of the Best Sustainable Energy Investment Instruments at the Local and Regional Level.

The figure above demonstrates how the financial construction of the KfW programmes issuing loans works: homeowners apply for the programs at their local banks. With their application, they have to submit an energy performance certificate from a certified energy adviser. Once the local bank approves the application and loans are disbursed, the bank gets this loan refinanced from the KfW. Applications for subsidies are made directly to KfW, unlike loans which go via local banks. Subsidies are available independently of an applicant's income.

Analysis/success criteria

Overall, the KfW programme "Energy- Efficient Refurbishment" and its predecessors have been remarkably successful: Evaluation reports demonstrate positive effects of the programmes in terms of investment stimuli, energy savings, CO2 reduction and the impact on employment, as well as positive impacts on public budgets (Forschungszentrum Jülich, 2011). The KfW's programmes for existing buildings are described as "a big success" (IEA, 2007). Boonekamp and Eichhammer (2007) state that the German programmes are one of the few examples in Europe, where "long term financial [policy] efforts (...) had considerable impacts in terms of energy savings and CO2 emissions reductions". Out of Germany's total building stock of about 40 million residential units, 29 million were constructed before 1979. Of these, about a third, i.e. almost 10 million had been refurbished leading to improved energy efficiency performance by 2010 (KfW, 2010). This figure is substantially higher than in other European countries (Schröder et al., 2011)

A number of factors have been identified as reasons for this success:

- The fact that comprehensive energy efficiency improvements are mandatory at every significant renovation provides a strong driver for the uptake of KfW loans and grants.
- The KfW programmes are part of a broader approach taken by Germany to improve the energy performance of buildings. This approach consists of three pillars, i.e. a clear legal framework; strong subsidy and loan programmes; and promotional information, advice, and support (Menzer, 2010, cited in Schröder et al., 2011). For the latter, the German Energy Agency (DENA) plays a central role in providing information, expertise, and practical know-how, but not directly giving project advice or delivering projects itself.
- There is a clear link between the amount of subsidies and size of loans with the ambitions of the energy-efficiency retrofit, which incentivized home owners to undertake more ambitious measures (KfW, 2010c, cited in Schröder et al., 2011).
- The shift towards preferably supporting comprehensive refurbishment of whole buildings rather than single measures has increased investments per building and overall efficiency improvements (Schröder et al., 2011).
- Germany's approach to the refurbishment of buildings is comprehensive in the sense that a wide range of actors and buildings are eligible for support, i.e. almost all domestic buildings, including ones owned by landlords, tenants and publicly owned buildings. Only applicants who are not credit-worthy or who suggest too pricey measures are not eligible (KfW, 2010c, cited in Schröder et al., 2011).
- The fact that KfW is a publicly supported investment bank and the way how loans are disbursed through local banks across all regions of Germany greatly increases confidence in the approach by private sector players and the general public and leads to high efficiency and leverage. The approach also reduces marketing costs for KfW as its local banks are responsible for the transactions and earn an interest margin for the handling of the process (KfW, 2010c, cited in Schröder et al., 2011).
- A broader study (Klinckenberg Consultants, 2010) which analyzed a range of financial support schemes to improve energy performance of buildings including the KfW programmes suggests that schemes which are not directly delivered by governments but by third parties generally seem to be effective.

Although the total numbers of buildings for which energy efficiency performance has been improved are impressive, the current rate of refurbishment is not fast enough to reach the German government's climate targets. It's estimated that a doubling of the current rate of refurbishments would be required (Kwapich, 2010b, cited in Schröder et al., 2011). On the one hand, a faster pace of refurbishment is constrained by the availability of public funds to finance the interest rate subsidies and direct grants, especially as energy efficiency requirements become more stringent and thus the required investments for refurbishments more expensive. On the other hand, there are also structural characteristics of the German housing market which may slow down the rate of refurbishment: Compared to other European countries, Germany has a relatively high rate of rented buildings / apartments. In Germany, about 40% of households are owner occupied buildings or apartments (KfW, 2010). In rental buildings, due to split incentives, fewer incentives for efficiency improvements exist than in owner-occupied buildings. In addition, there are regulations which limit annual rent increases even after significant energy efficiency improvements. This may disincentivize property owners to undertake ambitious renovations. Moreover, in some regions of Germany, especially in the former Eastern states, the rental market is demand-

driven and the willingness to pay for premium features in living space is low, thus driving rental prices down and limiting ambitions for energy efficiency improvements (Schröder et al., 2011).

Replicability for Belgium

KfW's programmes for "Energy-efficient renovation" can certainly guide approaches in other countries like Belgium. However, we may not forget that that KfW is a relatively unique institution with its history in the reconstruction period following the Second World War. Moreover, KfW does not operate independently of its context, but is part of a complex system including the rules and regulations around energy performance in buildings, support through the German Energy Agency etc. These aspects would make it challenging to closely replicate the approach in Belgium. The reason why this example is mentioned as an interesting case for Belgium, is that it shows the advantages of a close cooperation between energy policies and a financial body closely linked to the public authorities (KfW is above a very profitable financial institution). Possibilities are to set-up a similar public promotional bank (part of KfW) or a selected commercial bank that would be willing to pick up certain of these tasks by for example soft loans (Belfius?).

ERDF - France Social Housing

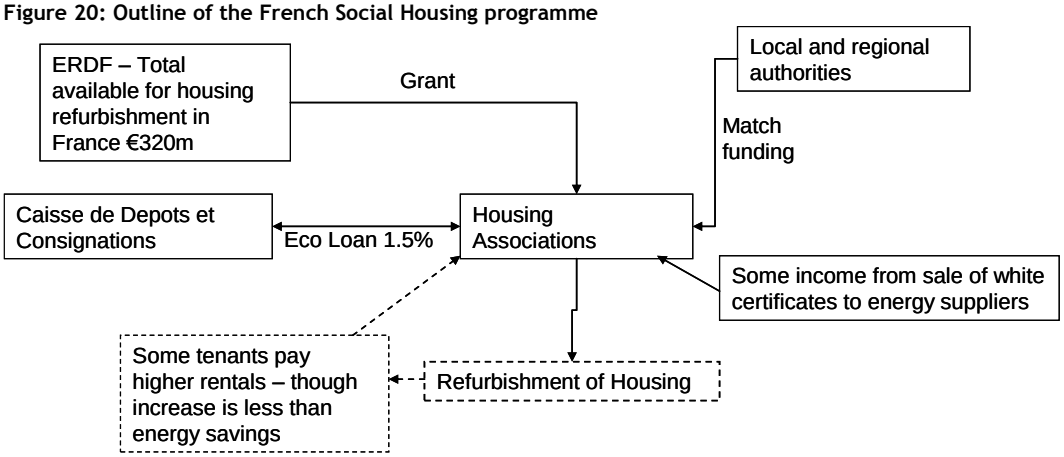
The French Federation of Social Housing, is an umbrella body for around 800 social housing providers, and has been instrumental in setting up the Eco-loan scheme to drive investment in energy efficiency in the social housing sector. The initiative came about due to the revised ERDF regulations, which increased the maximum funding envelope to EUR 320 million and created the ability to invest structural funds in social housing thermal renovation projects. This represented a huge opportunity to utilise ERDF capital for social housing refurbishment. It also coincided with a new energy policy and associated targets for the French social housing sector. The federation has played an important advisory role in the development of the Eco-loan scheme, representing and advising their members throughout the country whilst lobbying nationally for an Eco-loan scheme to drive investment in the social housing sector.

The programme has largely been driven by the three associated drivers of carbon emission reductions, climate change concerns and energy affordability. Of these the energy savings and associated affordability were the most important drivers. The programme has been facilitated and funded by the Caisse des Depots et Consignations (French Social Housing Bank) and the French Environment and Energy Management Agency (ADEME).

The main focus of the project has been on energy efficiency investments, but it has also been used to fund renewable energy and district heating schemes where appropriate, as part of larger schemes. The Eco-loan scheme is provided by the Caisse des Depots et Consignations and is able to provide low interest rates of 1.9 %. This rate is partly subsidised by the French Government. Properties that have undergone renovations also benefit from the added incentive of reduced council tax rates.

The project is a relatively recent development, and has only been operational since mid-2009. There are many projects being funded by the loan scheme at different stages of the project cycle e.g. pre-application, application, current, funded, finalised etc. The following graphic outlines the estimated energy performance, of the housing stock that will be improved, before and after the ERDF funded renovations.

Figure 20: Outline of the French Social Housing programme



Source: Trinomics (for DG ENER), 2012, Identification of the Best Sustainable Energy Investment Instruments at the Local and Regional Level.

It is difficult to generalise about the financial characteristics of how the ERDF has been allocated throughout France as it differs between different regions and Housing Associations. There is no overarching model that applies everywhere. In its most basic form Housing Associations have been able to apply to their local public administrative body for refurbishment projects through a simple allocation process. The remainder of the finance comes from the Social Housing Bank, reserves, or loans. However, different approaches were also utilised. In areas with limited ERDF allocations they used specific targeted project calls/competitions to try and improve the quality and level of innovation within projects, in order to gain maximum value for money from their ERDF allocation. In the Champagne region, the Social housing association takes out the loan and acts as the bank for the project. This tool simplifies the application process, meaning there is just one application process as opposed to up to five funding applications for the same project. At the core of the scheme are preferential loans (1.9% interest). The scheme coincides with a new energy policy and associated targets for the French social housing sector.

Analysis

Whilst the simple allocation process has had significant successes, the financial crisis made public authorities and lenders seek out more innovative ways to reduce project risk and fund sound projects. This is particularly the case in the area of social housing energy efficiency investments, where the project benefits are multiple and the investments leveraging potential significant. In terms of improvement the allocation process, there are also moves to do so based on “quality” of energy saving project and innovative financing methods.

One of the main barriers to establishing the initiative at the outset was the lack of formalised partnership working. National, regional and city wide bodies and associations all had similar overall objectives, but very different approaches and mechanisms with which to achieve these objectives. The “prize” offered by the recently available ERDF funding had a “mobilising role” and brought the relevant parties involved in social housing throughout France around the same table for the first time. The other major challenge for this project has been the scale and complexity of the project and the limited financial window within which much of the preparatory activity has had to be undertaken.

The overarching ERDF funding schemes is applicable to a range of investment types, but in itself, has not demonstrated much innovation. This has happened on a local and regional scale and this should be learnt from for future funding rounds.

After careful consideration and first-hand experience, the French Federation of Social Housing made the following suggestions for how the financing of this type of programme could be improved in the future. These suggestions and comments were as follows:

- To bring the experimental period whereby the cap is set at 4% of the national ERDF envelope to a close, thereby unlocking its full potential. By removing this cap it could unlock significant local job creation potential, help leverage significant additional funds, fight fuel poverty, and improve the purchasing power of residents, whilst also improving the energy performance of buildings.
- Provide and facilitate suitable flexible energy efficiency funding tools to effectively mobilise finance throughout all EU regions and Member States. This could be in the form of financial engineering tools such as interest subsidies, dedicated guarantee funds or revolving investment funds (working alongside existing subsidy-type elements) dependent upon the regional requirements.
- Support regional coordination and communication programmes, including customer behavioural change, communication and support initiatives.
- Reduce the administrative and regulatory charges levied upon energy investment project initiators. The costs of appraisal, control and state aid are significant and can deter potential project initiators, the simplification of these processes should be a focus for reform within the EU's cohesion policies. This could be achieved through a single request dossier (ERDF and national contributions) and a unification of energy performance criteria, within future regulations.

Replicability for Belgium

France used 4% (max allowed) of its total ERDF allowance to improve the energy performance of social housing. This could also be done by Belgium. Similar to the French regions, also the set-up can be slightly different between the Belgian regions. The key stakeholder in this process is the central housing association that should take up the role as coordinator. To make this working in a Belgian context, you need a Belgian equivalent.

EIB - France HQEE

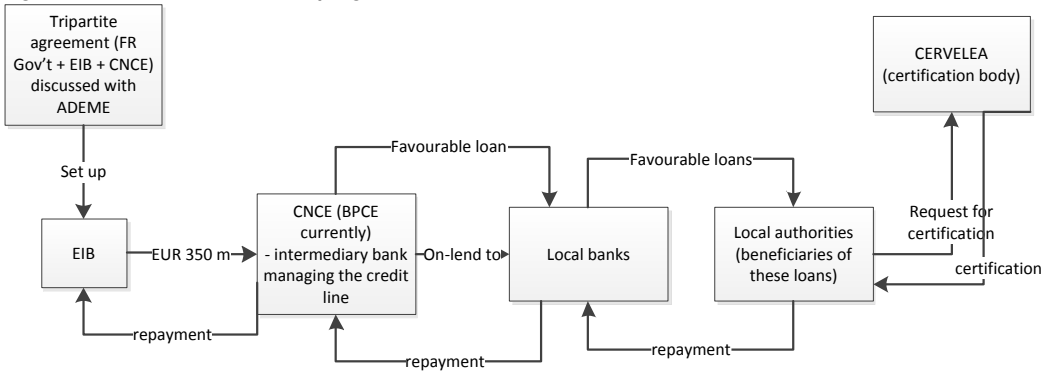
The programme Facilité Haute Qualité Énergie Environnement (HQEE) was set up to accelerate the attainment of the targets laid down in the EU's Energy Performance of Buildings Directive or EPBD (EU Directive 2002/91/EC). The programme has been the first of its type in Europe for the EIB. Since this programme has been extremely successful and demanded by regional authorities, currently, there is a second wave of such a programme (HQEE II) with a total fund size of €700 million. Funding from HQEE II is even more demanded, also due to difficult access to funding. A third wave (HQEE III) is under discussion. Since the French law has changed during the programme (adoption of RT 2012, which requires an energy consumption lower than 50 kWh/m^2/year), the eligibility for funding is stricter in HQEE II. Only buildings with these labels are eligible: low energy consumption buildings (LECB), positive energy buildings (PEB) and Programme of Research into and Experimentation on Energy in Buildings (PREBAT). Since low energy consumption buildings (LECB) is a rule for tertiary sector since 2012, there is a significant increase in such sub-projects and hence, a demand for funding.

The HQEE Programme funded both construction and refurbishment of public buildings. Typical beneficiaries were schools and colleges, crèches, administrative buildings, sports and leisure centres, and community centres. The goal was also to have a regional distribution of funded projects. The results of this programme show that all the applications submitted except of one concern construction or construction/refurbishment operations. This is due to the fact that the law in question does not apply just to refurbishment operations. To be eligible for funding, projects must meet one of the defined energy performance criteria and be within the cost range €0.5 – 150 m. There is no concern, yet, about the cost-effectiveness of these projects. Applicants must show proof of having achieved higher standards by being certified by one of the certification bodies. At the end of the project, beneficiaries of the funds must submit forms A and B with the required certification to Caisse Nationale des Caisses d'Épargne (CNCE) and the European Investment Bank (EIB) as a verification. The process of verification has not been finished yet. In case the projects do not succeed getting this certification, the promoters will have to reimburse the EIB.

To implement the HQEE programme, CNCE used EIB resources to support the promoters of projects involving the construction or refurbishment of public buildings throughout France. Use of EIB funds enabled CNCE to offer better loan terms to local banks, which then subsequently offered better loan terms to final beneficiaries meeting more stringent energy-saving and environmental standards. The loan of max EUR 350 million has been distributed to the beneficiaries entirely through local banks, administered by the CNCE. The total size of the Facilité Haute Qualité Énergie Environnementale programme was estimated at approximately € 1 200 million.

In the flowchart below, the financial structure of the HQEE is presented to clarify all the relationships between the different stakeholders.

Figure 21: Outline of the HQEE programme



Source: Trinomics (for DG ENER), 2012, Identification of the Best Sustainable Energy Investment Instruments at the Local and Regional Level.

Analysis

Strengths:

- The loan is available at competitive rates and other sources of funding are becoming much more difficult to access;
- CNCE and other local banks are credible and proactive on this issue – EIB distributes the envelope only to CNCE, which then decides to which local banks it on-lends. Only if there has been an

application for a large envelope for a single region, EIB got more involved in the decision-making to maintain maximal regional distribution.
- The change of law demands stricter energy and environmental standards, this increases the demand for such loans considerably;
- EIB was involved in approval of the projects. This process went very fast, i.e. EIB was able to offer a rapid reply (2 days to 2 weeks) to the CNCE. This is quicker than other sources.

Weaknesses:
- Certification is costly (e.g. €20 000), which becomes a problem for smaller projects – in HQEE I a window of tolerance has been applied for small projects. If 'bureau controle' gave an approval of the project that the energy standard has been reached, the project needed no certification.
- The intermediary banks do the analysis of projects. In some cases, they also lack the know-how how to evaluate such projects.
- Energy efficiency and cost-effectiveness analysis has not been performed. This means that even extremely expensive projects whose benefits of improved energy efficiency might not outweigh these costs are still funded. The 'low-hanging fruits' are necessarily not supported.
- Moreover, quantification of the effect has not been done. Actual energy savings of projects have not been reported so far.
- The funding has been largely based on trust of beneficiaries (the certification occurs only during the project, not ex ante). This type of programme might not always be applied in other countries, where the trust in public authorities and local financial institutions is lower.

Lessons learned:
- The project reflects the importance of definitions in achieving energy efficiency, as it needs to clearly reflect an improvement over the baseline/counterfactual. All the projects funded via this programme fit these criteria as they are focussed on going clearly beyond the current (at the time) construction energy standards.
- Project also recognises that ex post evaluation is key – all individual projects are obliged to submit an installed energy survey to prove that the predicted energy savings are achieved.
- Due to the significant demand for such funding, EIB can go a step further and be even stricter with the selection of projects (in terms of energy performance of buildings).
- Regarding promoters, a lesson learned is that if they would like to have their project financed, they need to go to that selected local bank.
- It is also important to educate end customer – in this regard a joint conference of BPCE and ADEME has been organised for local authorities;
- Start with a selected few sectors, such as administrative buildings and schools;

The success factors relate to these aspects:
- CNCE is highly experienced, highly credible and proactive financial intermediary - a leader in the sector in France, with capacity to implement the project and who poses negligible credit issues and implementation risk;
- Alternative access to funding has been more difficult to obtain and the EIB loan offered the financial intermediaries to offer competitive rates and conditions of loans;
- The programme was managed efficiently also from the side of EIB, i.e. fast response

Replicability for Belgium

The concept is straightforward and should be reasonably easy to replicate, also in Belgium. It uses existing financial infrastructure, ensuring low overhead costs. A critical note can be placed though: the programme seems more suitable for the funding of relatively large projects and it requires credible and wealthy public authorities. You need to have a financial institution like Caisse Nationale des Caisses d'Épargne which can make the bridge between the EIB and the local projects.

JESSICA - HOLDING FUND LITHUANIA

The JESSICA Holding Fund Lithuania (JHFL) is established in Lithuania in June 2009 to support renovations for energy efficiency in housing. In fact, the programme creates incentives for house owner associations to invest in the energy performance of their building envelope. Apart from the direct incentive in the form of a grant, there are favourable loans to finance the remaining 80% of the project costs. Moreover, the applicants can get technical assistance from the Housing and urban development agency. The Lithuanian government chose to target multi-family apartment buildings because the largest energy savings were identified in this sector; around 66% of the Lithuanian population lives in multi-family buildings built before 1993. These apartment blocks are usually in poor physical condition, with a corresponding low energy efficiency.

The programme targets apartment blocks rather than individual apartments. That means that applicants are associations, representing several home owners. The number of eligible apartment blocks in Lithuania is estimated to be 24 000. The total yearly energy saving potential is estimated on 300 GWh.

The JHFL loan can be combined with subsidies, loans and other financial products.

Technical assistance is provided by the Housing and urban development agency. This agency is a public body, with the following tasks and responsibilities:

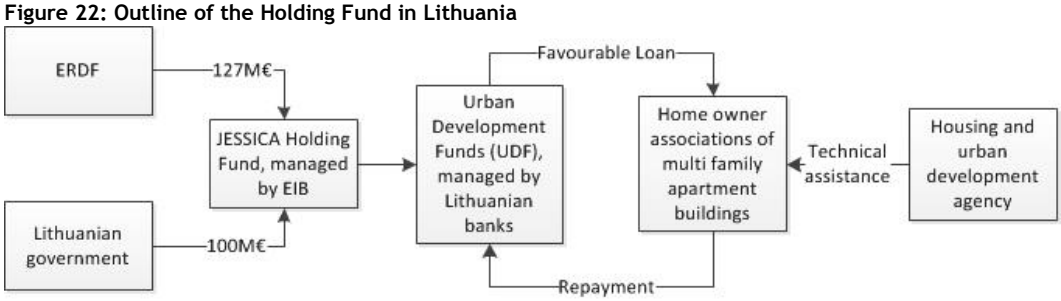
- Provide administration;
- Provide counselling on legal, technical, financial, organizational and other issues;
- Implement marketing and communication strategies;
- Organize training and education in the areas of management, accounting, house administration and planning;
- Prepare housing maintenance and exploitation programs and projects seeking to encourage establishment of Home Owners Associations;

The JESSICA Holding Fund Lithuania (JHFL) is developed by the European Commission, the EIB and the Council of Europe Development Bank (CEB). The fund amounts to € 227 million, with € 127 million coming from the ERDF and EUR 100 million from public national co-financing.

Commercial banks act as a local operator and issue loans against relative low interest rates. The commercial banks are paid a fee for their administration costs, and part of the interest rate is subsidised to make them relatively low. These local banks are joined in a consortium, the co-called Urban Development Fund (UDF).

The JESSICA Holding Fund Lithuania is a revolving fund, thus allowing the Lithuanian government to recycle (part of) the financial resources. In the flowchart below, the financial structure of the JFH is presented, making the relationships between the stakeholders clear.

Figure 22: Outline of the Holding Fund in Lithuania



Source: Trinomics (for DG ENER), 2012, Identification of the Best Sustainable Energy Investment Instruments at the Local and Regional Level.

Analysis

Strengths

- The JHFL loan can be combined with subsidies, loans and other financial products;
- The fact that the house renting market is small in Lithuania makes it more easy/sense to implement this energy savings scheme; there is no split incentive;
- The local approach using local banks to manage the UDF's enables local knowledge, expertise and networks;
- JHFL has a positive effect on employment; it provides a boost for the construction sector, which was heavily affected by the economic crisis;
- The old government program did not work well because its resources were limited, and the budget reserved for the grants was quickly exhausted. The new JHFL scheme has a revolving nature and is thus better suited for large scale operation involving many projects. Moreover, it can easily be calculated how many projects can be funded per year in order to keep the fund healthy. For the time being, the demand can be met, meaning that all eligible requests can be approved;
- It makes sense to include the costs for the initial preparatory studies in the loan;
- Marketing and communication has helped to reach the target group.

Weaknesses

- Implementing relatively complicated programs such as the JHFL demands a culture shift from government officials. This was a barrier initially, but it appears this barrier has been overcome.
- The scope of the program was limited to the building envelope and home owner associations. There is a wish from the EIB and the local operators to expand the scope.
- The administrative burden (red tape) is still relatively high compared to a one-stop shop.

Opportunities

- Weaknesses often also provide opportunities: the programme has a limited scope for the time being, since it focuses on multi-apartment buildings and student dormitories and is restricted to financing mainly energy efficiency investments. Expanding the programme to include public buildings is currently under investigation, thereby potentially increasing the national energy saving potential.

- There is a wish to combine the JHFL with other funds and programmes in order to expand the scope and reach (even) better energy saving performances, thereby reducing CO2 emissions. For instance, JHFL was combined with other funds for the refurbishment of the student dormitories which worked out well.
- The program officials gained a lot of experience with the implementation of the JHFL and want to use this experience to expand the scope of the programme and make it more flexible.

Threats

- As mentioned above, the previous government grant scheme quickly ran out of money, forcing the government to reinject money, or to terminate the programme. It was mentioned that this undermined the general trust in government programmes, which is thought to have hampered the uptake of the current scheme.
- Another issue raised during the interview relates to a lack of transparency in the financial structure, making people weary. Naturally, good communication and marketing could overcome this barrier.
- The scheme was launched in a period of economic downturn. This raised the question whether the grant component of the scheme should be increased so that the own capital demand could be decreased. The Lithuanian government decided against this, as they were afraid that a change of conditions might further undermine the trust in government programmes.

Replicability for Belgium

The concept of the JHF Lithuania is rather successful but also (too) complicated. The **revolving nature** of the JESSICA Holding Fund Lithuania is well suited for large scale operations such as big renovation programmes. The risk of exhausting a revolving fund is smaller than for a public grant financing scheme. It is possible to replicate such a concept in Belgium but certain conditions need to be fulfilled. First of all you need a regional or local government willing to participate in such a process. The Jessica holding fund (or similar) is made available by the EIB but the Urban Development Fund should be created and managed by local banks. Our experience is that these local banks ask high fees to run these kind of funds (or we should go for the principle 'no cure no pay'). Also important is to have enough **Technical assistance** in the implementation phase to train the public servants and to streamline this process otherwise this would lead to very long lead time for forming of the project pipeline. Finally, home owners should be organised in an association and interested to take up an active role in this process.

4.3.3 Savings obligations

ENERGY SAVINGS OBLIGATIONS IN THE UK

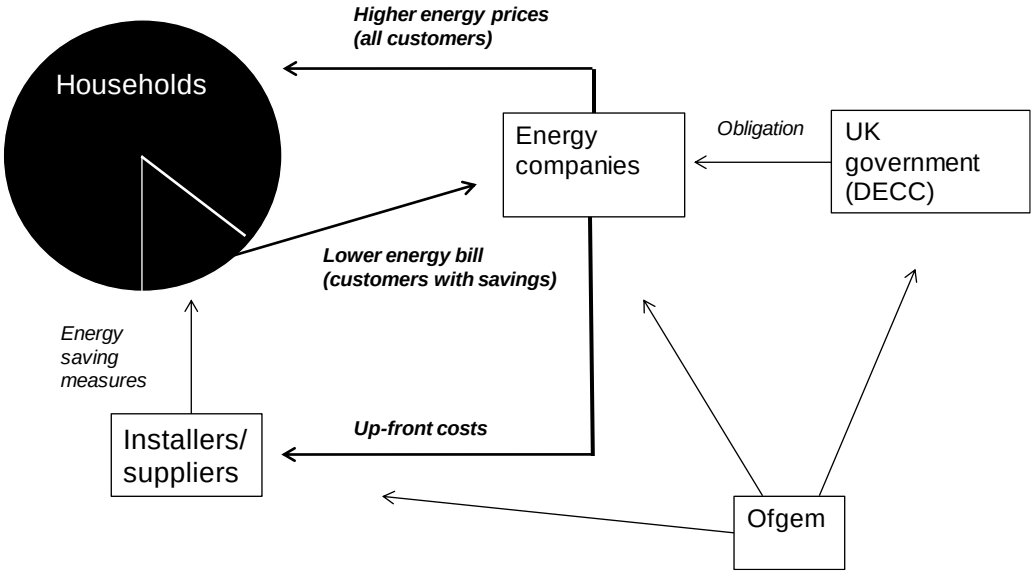
The primary aim of CERT[80] (Carbon Emission Reduction Target) is "to make a contribution to the UK's legally binding target under the Kyoto protocol (to cut greenhouse gas emissions by 12.5% below 1990 levels by 2008-2012) and the Climate Change Act 2008 requirement (to cut emissions of greenhouse gas emissions by 80% below 1990 levels by 2050). However, CERT will also help to reduce energy demand, enhance the UK's security of supply; reduce energy bills for those receiving measures; reduce fuel poverty and, secure jobs in energy efficiency industries". Greenhouse gas emissions reduction is the primary aim, whereas positive social-economic impacts, especially reducing energy poverty, are important side goals. It obliges all large domestic energy suppliers to realise energy savings in

80 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350722/CERT_CESP_Evaluation_FINAL_Report.pdf

households. The programme incentivises measures, such as insulation which has a high saving potential. But it also restricts certain measures. Lighting products were excluded from the scheme as of April 2011 (for example, CFLs have already been massively provided by the UK obligation scheme).

The Energy saving obligation schemes first began in 2002 in the UK, by the name of the Energy Efficiency Commitment (EEC) programme (2002-2008). In 2013, the CERT and CESP (Community Energy Savings Programme) were replaced by one obligation programme: the Energy Company Obligation (ECO) which was integrated with the wider Green Deal programme.

Figure 23: Outline of the UK's Energy Savings Obligations programme



Source: Trinomics (for DG ENER), 2012, Identification of the Best Sustainable Energy Investment Instruments at the Local and Regional Level.

Energy suppliers are free to decide how to achieve their targets, but will typically promote the most cost-effective measures (cavity wall insulation, loft insulation) using subsidy. Energy suppliers pay the costs (or part of it) of the saving measures, either to homeowners or to suppliers like manufacturers and retailers. This happens in various ways depending on the measures. Energy suppliers provide measures to priority groups usually for free such as insulation and CFLs, fund promotion and installation by social housing providers, fund price reductions at retailers, and subsidise part of the price (for example half of it) or fund promotion of efficient appliances by manufacturers. Apparently this is sufficient to persuade enough households, as the current programme seems to be on track and all previous targets have been achieved. Information is confidential on where and how energy suppliers get the financial means to meet the obligations. They are expected to have benefits from the programme, because they offer a new product which can retain or increase their customers' base.

Energy suppliers are allowed to pass on their costs to any customer (in theory, also those outside the UK), not only those who install measures. They are assumed not to pass on all costs, but to carry part of it themselves. Besides the operational costs for performing the scheme, the government does not provide funding for CERT. Also, no special local policies or legal arrangements have been required for executing the CERT scheme.

In the scheme up to 2013, households do not finance any costs themselves. Average installation costs per household are only in the order of 500 euros (usually one cavity or loft wall insulation measure is installed, possibly combined with other small measures). The new ECO scheme, which replaces CERT, will not focus on the same low-cost measures, such as cavity wall insulation. It will instead focus on solid wall insulation for older (e.g. pre-1930s homes). Whereas cavity wall insulation costs in the order of 500 euros per home, solid wall insulation can cost in the range of 7000 – 15000 per home. Of the 26 million UK homes, about 7 million need solid wall insulation. To reduce energy supplier costs, it is likely that these costs will be met with a combination of ECO subsidy from suppliers and financing by homeowners. Green deal finance (e.g. on bill financing) will be developed, which the householder repays over time (possibly up to 25 years) through charges on their energy bill. When a household moves, the green deal finance is left to the new owner. The condition of green deal financing is that the energy savings offset the financing costs.

Energy suppliers hire installers to deliver measures. Furthermore, energy suppliers have partnerships with several parties (housing corporations, municipalities, manufacturers, etc.) who also promote and realise measures at the target group.
Energy suppliers will get a penalty from Ofgem, if they do not reach their target. This fine can be substantial (up to 10% of their global turnover), but will depend on the nature of their short-fall.

The government had the choice of having the market (suppliers) perform and pay for savings, or having the government perform and taxpayers pay for savings. The current system was chosen as suppliers operate in a liberalised and competitive market and have a direct relationship with every household. The government assumes that the pressure of competition drives delivery costs down to realise the carbon reduction target more efficiently than a centralised Government programme would be able to.

Analysis

Strengths

- The main strength of the programme lies in the fact that energy suppliers are obliged to save energy, which tackles many barriers to energy savings.
- All households eventually pay for the suppliers' investments via higher energy prices, so all have an incentive to undertake measures.
- The CERT is very attractive to homeowners, as energy saving measures are largely sponsored by energy suppliers and installation is taken care of.
- The CERT stimulates the development of an energy saving market, creating benefits in terms of employment, knowledge building, etc.
- The programme has a suitable organizational structure. Energy suppliers are suitable parties to realize large scale energy savings (suppliers collectively have customer relationships with every UK household and they have finance, administrative, promotion and knowledge capacity). The energy market regulator, a national and separate government organisation (Ofgem), administrates the programme.
- The priority group focus on low income households ensures the benefits of the scheme are distributed equitably to all consumers, not just the ones with better disposable incomes. Furthermore, it reduces the chance of free riding, as lower income households are less likely to have taken saving measures anyway.
- Homeowners get the opportunity to not only decrease their living expenses, but also increase the value of their home. This means an additional economic benefit. Poorer families who currently

cannot afford to keep their homes to suitable temperatures, can keep their homes warmer and healthier, thus saving costs.

Weaknesses

- Energy suppliers face short term capital expenditures while receiving the benefits from higher energy bills only on the longer term. This may decrease their financial solvency.
- The method of supplying certain measures for free or at low charge can reduce the effectiveness of the programme. An example is CFLs, which were actually oversupplied. These may end up unused, which implies unnecessary supplier costs but no saving impact.
- Consumers tend not to trust energy supply companies, and often don't understand why they would want to help them to actually save energy.
- The government does not have information on how much the scheme costs suppliers to deliver, so all cost figures are estimates. They seek for ways to get better information in future schemes (i.e. ECO).
-

Opportunities

- The energy (and energy cost) saving potential can be considered high. The target segment are existing homes with high saving potential, and common cost effective measures like insulation are eligible in the scheme and even incentivized.
- Energy suppliers get the opportunity to build up a new service, by which they can increase and maintain their customer base.

Threats

- A serious threat to the programme is its own success. Less expensive saving measures are realized first, so the remaining saving potential has to be realized by more expensive measures. This can endanger realising the programme's targets.
- The development of an energy saving market requires that the supply side of this market is timely available. Potential threats are a lack of installers, available materials, or knowledge.

The major success factor of the energy savings obligation programme is the mandatory nature. Energy companies are enforced and have no choice but to realise investments, and they are capable of doing so. The programme is further able to realise savings in the existing housing stock where it is very difficult to realise energy savings by voluntary policies or commercial activities. Barriers are the large up front investments the energy suppliers need to make.

The business model helps to make the programme cost effective for stakeholders involved and reduce financial risks for homeowners. It enables suppliers to charge higher energy prices to customers to earn back their investments, whereas customers do not have to make an up-front investment. An opportunity in the programme is the large energy saving potential in existing dwellings. A serious threat to the programme is that the remaining energy saving potential becomes more and more expensive to realise.

The overall carbon targets were, broadly speaking, achieved. "CERT delivered a high volume of carbon savings, with 296.9 Mt CO2 being achieved as reported by Ofgem[81], in excess of the 293 Mt CO2

[81] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350722/CERT_CESP_Evaluation_FINAL_Report.pdf

required by the obligation. This was, largely, due to the wide range of measures that were eligible under the programme.

Replicability for Belgium

Belgium has 'officially' a similar kind of target for its energy companies (as a result of the transposition of the EED). However, it is not clear how well this is followed up. As such, no results are available of the transposition of this article of the EED. Consequently, it would be interesting to have a close look at the UK system, as it was the first of his kind in Europe and has proved to be result-oriented.

4.3.4 Conclusions & recommendations

The structure, set-up and impacts of financial instruments cannot be separated from the framework in which they are embedded. The success of a scheme depends on more factors than just the financial terms and conditions. However, some general conclusions regarding the financial instruments can be drawn.

At the core of most successful programmes are preferential loans, potentially complemented with a grant and/or Technical Assistance package. Flexibility in the amount of the grants enhances the effectiveness of a scheme. Measure specific grants enable programmes to pick also the higher hanging fruit by providing extra subsidy for measures with a long payback period (KfW). A successful strategy is to offer financing with very attractive conditions when implementing a programme, along with the measures (such as cash-back subsidies) focusing on behaviour and confidence building among energy users. Such programmes become popular and can then decide to decrease their grant percentage or set higher standards (EIB HQE FranceL), to maximise effect. Note that too many changes may undermine confidence, especially in countries where people already tend to mistrust state programmes (e.g. JHF Lithuania).

Minimum thresholds for co-funding improve the leverage factor, but can be dangerous in financial downturns. Under such conditions, commercial co funding becomes more difficult since banks tighten their loan terms. It makes a scheme vulnerable for economic fluctuations. Flexibility, again, is important.
EPC can be an effective way to channel private funding into large scale projects, but requires a lot of expertise, and preferably cheap access to capital for the ESCOs.

Replicability for Belgium is very different for each instrument and even sometimes case specific. Some instruments and concepts are easier and less costly (due to the necessity of an institutional set-up) than others. However, several instruments could be replicated quiet easily, at least if there is a political willingness and support of the concerned administrations.

In addition to these observations, we have identified the following best practice elements:

1. A simplified, possibly one-stop shop, administrative procedure
   In a one stop shop concept, a project applicant deals with only one agency where ideally only one application has to be filed. From this moment on, the agency takes over the whole procedure. This concept reduces red tape and the application threshold.

2. A revolving fund

This set up enhances fund longevity and liquidity predictability, as opposed to a regular fund.

3. Inclusion of local expertise
   EE programmes are preferably run by local institutions, such as a policy department on a municipal level, local banks and companies dedicated to technical assistance. This allows the actors to build up a trust relation and provides an impulse to the local economy. This best practice shows similarities with an ESCO set-up, according to the EPC business model, but without the heavy overhead structure that results from the complex (negotiated) contracts and required verification of savings[82] [83] [84].

4. Informing citizens
   This enhances demand and removes fear and perceived risks.

5. Flexibility in (European) funding conditions
   As explained, this creates room to adapt the national/local schemes to the specific barriers and opportunities in that region, increasing effectiveness in terms of energy saved, and efficiency in terms of Euros spent.

6. Imposing obligations
   Imposing obligations for the industry, utilities, new buildings and/or housing associations provides an incentive to invest in EE and enables programme designers to set pre-defined performance standards as a minimum threshold for eligibility.

7. Provision of a Technical assistance (project development) package
   The provision of project level Technical Assistance provides programme managers with the required expertise to smoothen the process, deal with marketing and information services, and evaluate the installed measures.

[82] Berliner Energieagentur GmbH (2008). International Experiences with the Development of the ESCO Markets. [Online] Lamers, P., V. Kuhn and A. rechting.
[83] Views on the emerging Dutch ESCO market: Can it become successful?, Sanne de Boer, Utrecht University, available at: http://www.struktonpps.com/SiteCollectionDocuments/Publicaties/Views%20on%20the%20emerging%20Dutch%20ESCO%20market_%20Can%20it%20become%20successful_Sanne%20de%20Boer.pdf
[84] Mora Associates (2010). Energy Service Companies (ESCO): Monetization of energy efficiency. [Online] Wagner, L. Publication is available at: http://www.moraassociates.com/publications/1002%20ESCO.pdf.

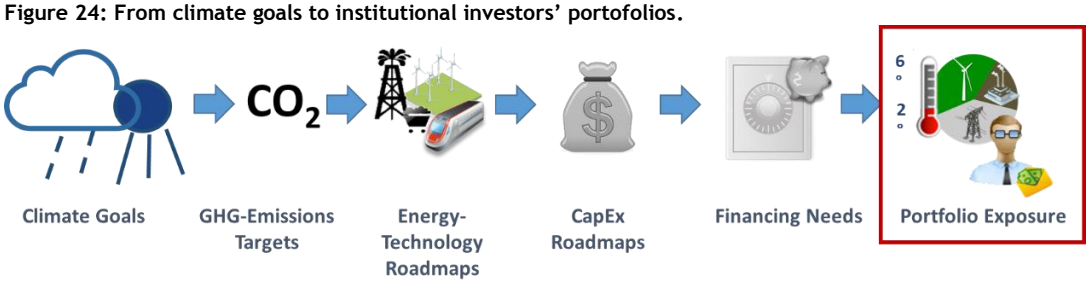
5 Tracking climate finance: challenges and recommendations

5.1 Key challenges

One of the challenges in Belgium, when doing research on climate finance, is its typical federal structure with competences spread between the federal and regional authorities. In Belgium, both the federal and regional governments are authorised to draft energy and climate PAM's (Policy And Measures), which results in **climate measures and policies existing on both national and regional level,** but sometimes targeting the same actors and activities. The regions have the largest share of responsibilities as they are in charge of all renewable energy polices (except for offshore wind) and for most energy efficiency policies (and thus the biggest part of the mitigation activities), but the Federal government also supports energy efficiency and renewable energy (e.g. through tax reductions) and has its own ministry of Energy, environment and sustainable development. As the reporting of the implementation of the European energy efficiency directive (EED) and renewable energy directive (RED) has to be aggregated at national level for EU reporting, the aim should be to have a more global approach to track climate finance in Belgium. First of all to report on a standardized basis at national level but also to share best practices and to achieve synergies across the different regions. The key challenge will be to set up coordination activities between the federal level and the regions.

Another challenge is that we miss a clear vision on which way to go with our climate policy. We do have climate goals and greenhouse gas emissions targets (supplemented by several scenarios) but we miss a conceptual framework linking these climate goals to energy-technology roadmaps and financing needs. The below figure gives a good overview of the different steps needed to link climate goals to institutional investors' portfolios[85].

Figure 24: From climate goals to institutional investors' portofolios.



Source: Trinomics (for DG Clima), 2015, Shifting Private Finance towards climate-friendly Investments

The biggest challenge of this study however (which is a result of the above) was the fact that people couldn't clearly answer the question of what climate investments are! Consequently it is difficult to track them. Public institutions and private companies have never been asked to define (we don't even talk about reporting) their climate activities and as such they don't track the related investments. Consequently, there is a huge lack of data availability in all the sectors. We lack on all levels and in all sectors **a framework to follow-up and report** with **a clear set of indicators,** covering the whole process such as finance and resources[86]. **For Private sources**, corporate and household actors who

[85] We refer for more information on this topic to our study for DG CLIMA, Shifting Private Finance towards climate-friendly Investments, 2015.
[86] Priya Barua, P., Fransen, T., Wood, D. (2014). *Climate policy implementation Tracking framework*. Retrieved from http://www.wri.org/sites/default/files/climate_tracking_framework_working.pdf

invest in climate specific measures are **not required or incentivised to report their investments**. For certain subsectors, such as for renewable energies, the link between their major activities and climate specific investments can be more easily made (also thanks to existing financial incentives). However, for most (sub)sectors, these linkages don't exist and as such results can only obtained with the help of assumptions. This is especially for household and corporate investments.

5.2 Lessons learned related to tracking data

The **lessons learned** will focus on the barriers and solutions to:

- **Collecting the required data**. Since this study is the first that collected the data from Belgium to measure and report on national private and public climate finance, we observed that the necessary coordination and reporting mechanisms are not yet in place. The aim of the recommendations from this first data collection exercise is to arrive at an improved coordination between the different Belgian stakeholders and aligned reporting processes for (inter)national climate finance.
- Applying a robust yet **straightforward methodology and set of indicators for tracking and reporting on climate finance**
- Applying different methodologies and their pros and cons

The collection of relevant qualitative and quantitative data on climate specific and climate related investments in Belgium has proven to be very difficult. Specific efforts and measures will be appropriate in order to improve the monitoring, reporting and verifying processes of climate finance flows.

5.2.1 Tracking data from Public Authorities on National and Regional level

Considering the implementation of climate activities on the regional level, there is no central database (multi-policy and multi-sectoral) tracking the implementation of all climate related measures in the different regions. This means that to track data from the regional level, all public actors needed to be contacted individually to retrieve data. The quality of the data is not secured and the data is not measured in a standardized way. This means that reporting of (supported) investments and achieved reductions are not always available for the different policy domains or sectors.

There is also no standardized framework for the reporting of the regions to the national level. This means that for the implementation of measures targeting the same sector (e.g. industry) and the same activity (e.g. energy efficiency based on sector agreements) there is no central reporting obligation towards the federal level and thus no streamlined annual reporting. An evaluation of the impact of regional policy measures has proven to be difficult.

Attributing all public finance to climate-specific organisational measures is challenging (prefeasibility studies for climate related investments, investments in own building heritage, etc.). In public procurement, tracking budget for energy efficiency or climate related activities is missing on all levels.

Tracking climate finance on sub-regional (Provinces and inter-municipalities) and local level (municipalities) is currently not possible and will be more important in the future when implementing

the local Sustainable Energy Action Plans (SEAP's)[87]. Also for the Belgian Covenant Coordinators (21 provinces and inter-municipalities) and signatories (222 municipalities) an incentive will be needed to report on the implementation of measures[88].

Recommendation:
There is a clear need to install a **central registry and a streamlined annual report for all (EU, federal, regional, local) climate measures**. This national central database should cover all measure/project-related indicators to cover all reporting obligations and objectives.

5.2.2 *Tracking data from Private sources-Household and Corporate Finance*

As mentioned in the key challenges, private sources are difficult to track. Details regarding household and corporate investments are hard to determine. The reported investments are in this study derived from:

- The reported grants (as the leverage private investment)
- The reported reductions (investment cost related to the achieved production)

Recommendation:
Referring to the need of a national central registry, this database should also cover more information about the measures and projects on corporate and household level.
Encourage stakeholders such as **(public) institutions and sector associations** to report more extensively on the achieved results. For example for energy efficiency measures, ask not only to report on the achieved reduction or for renewable energy on production capacities but also the details of the installed measures (investment cost, implemented technologies and other energy reduction activities). Foresee a clear set of indicators to report cost related information (budget and source).
Also **by assigning public grants to corporations and households, more specific information related to the project** (reduction and investment) can be requested and reported in a more accurate and digital way.

5.3 Specific recommendations

This paragraph focusses on specific recommendations from a Belgian national context point of view, in particular what the Belgian government could do to stimulate a (larger) leveraging effect of financial contributions and investments from the private sector for a low-carbon pathway.
The recommendations reflect the different elements that have come to our attention in the previous phases and are tailored to the current investment climate, the envisioned strategy and the regulatory framework of the public authority. The instruments should target the unlocking of private funds for specific investments, a simplified administrative procedure and increase the financing with longer tenors.

5.3.1 *Continue to support energy efficiency measures with grants and policy incentives to compensate the incremental cost*

Tax incentives and grants are effective and transparent public instruments to support climate finance, if evaluated on a regular basis. The effect of tax reduction measures and grants is visible in the energy efficient retrofitting of buildings. Energy efficient retrofitting demands high upfront investments which

[87] Priya Barua, P., Fransen, T., Wood, D. (2014). *Climate policy implementation Tracking framework*. Retrieved from: http://www.wri.org/sites/default/files/climate_tracking_framework_working.pdf
[88] Covenant of Mayors. (n.d.) Covenant Coordinators. Retrieved from: http://www.covenantofmayors.eu/about/covenant-coordinators_en.html?q=Search+for+a+Covenant+Coordinator...&country_search=be&signatories

must be paid back by the energy savings and related energy costs. This includes the risk of uncertain energy prices. Grants and tax incentives decrease the upfront investment and make energy efficient retrofitting investments more profitable and secure. The REU-grant, for example, every EUR 1 supporting 'rational energy use' in buildings is estimated to leverage EUR 4 of additional private (households, corporations and public organisations) investments and are granted by the three regions.

5.3.2 *Combine public support and (voluntary) energy reduction programs*

In the Flemish industry sector, energy-intensive industrial companies can voluntarily join the A*udit Covenant* (0,1-0,5 PJ) and *Benchmark Covenant* (>0,5PJ). The Flemish government exempts the participating companies from further energy and CO_2-emission reduction measures and supports investments with the Ecology grant Plus and the Strategic Ecology Grant. The companies agree to apply all energy efficiency investments with an IRR > 15% and to report annually on both energy savings and investments (Audit Covenant). The result of both covenants was a CO_2 emission reduction of 320.000 ton in 2013. In combination with the Flemish Ecology grant Plus and the Strategic Ecology Grant, EUR 150 million was invested in energy efficiency measures, supported by EUR 16 million of grants. Almost EUR 25 million of total investments are financed by companies participating in the Audit Covenant. As the Audit Covenant represents 10% of total energy consumption, the share of total investments leveraged by the Ecology grans are almost double (17%), which proves the effectiveness of combining public support and energy reduction programs are[89].

5.3.3 *Investments in modal shift*

Investments in modal shift are mainly financed by public organizations that operate the public transport, railway transport and inland waterway transport infrastructure**. Public investments in modal shift can leverage private investments** if the investments in the development of sustainable transport infrastructure (e.g. railway and public transport connectivity) are aligned with the regional economic developments. This can be achieved by stakeholder participation. Investments in public transport infrastructure should indeed strongly focus on **economic hubs**, which are defined as areas with a high employment. These areas are **the most favorable to concentrate economic development and should have a high priority for public modal shift investments**.

5.3.4 *Renewable energies*

Investments in renewable resources need a stable and predictable regulatory framework to stimulate market parties to invest in low carbon energy generation technologies. The analysis showed that the uncertainty and frequent changes in the support scheme for renewable energy sources in 2000-2014 have led to heavily fluctuating investment levels during this period. On the other hand, renewable energy policies and the used instruments (level of the grant) should be evaluated on a regular basis (for some technologies even annually).

5.3.5 *Risk mitigation measures*

To date, Climate investments are often seen as high-risk investments. There is limited response from the finance sector, particularly by public institutions, to mitigate this risk for investors. **Authorities could facilitate the access to risk capital and other financing sources** by implementing measures and legislation that **reduce the risks for investors in low carbon technologies**. Adequate risk mitigation

[89] Aernouts, K., Jespers, K., Wetzels, W., Dams, Y. (2014). Energiebalans Vlaanderen (1990-2012). Retrieved from: http://www2.vlaanderen.be/economie/energiesparen/beleid/energiebalansVlaanderen1990-2012uitgebreid.pdf

measures allow to reduce the cost of capital and will hence enhance investments in for example renewable energy.

Most risk mitigation tools on the role of policy are still in a pilot stage. A less established tool for example is to develop an insurance scheme to underwrite the risk of retroactive policy changes made by governments to address the public/private risk perception gap (= a partial risk guarantee)[90]. Other tools that could be developed by Public Finance Institutions are partial-risk guarantees at the bond issuance stage, take first-loss provisions at the project or portfolio level or develop a green monoline (i.e. a government support for companies insuring green securities)[91].

5.3.6 *Financial institutions*

Financial institutions (retail, merchant and private banks, pension and hedge funds, etc.) should be encouraged to become more active in financing low carbon investment: specific financing products accessible to a large public (e.g. green bonds) could be made more largely available. Overall, the cooperation between the public and financial sector concerning climate finance, is currently rather poor and several possibilities can be considered to improve this cooperation. On the one hand, the public sector can become more active in organising adequate and good communication about the climate related measures and goals (and how to reach them). A common financial platform can be envisaged where representatives of the public and financial sector could meet on a regular basis. This could also push the financial sector to better organize itself in order to more efficiently address the climate activities it is currently involved in. On the other hand, the public sector could encourage the financial sector in taking new initiatives and becoming more pro-active. Joint actions are appropriate and feasible: there are several good examples in other member states where the banking sector is working closely together with the public sector in setting up climate mitigation activities and access to finance.

5.3.7 *New financing models*

New financing models should be stimulated: cooperative associations, crowd funding, funding through Energy Service Companies (ESCOs) or special purpose vehicles, public or local energy or climate funds, etc. are often efficient instruments to finance low carbon energy installations and climate actions. Several of these financial mechanisms/vehicles have proven to be successful in other member states. They will be in particular important in financing the local sustainable energy action plans (SEAP's) related to the Covenant of Major.

[90] "Renewable Energy Policy Risk Insurance: a way forward." Climate Bond Initiative, Climate Policy Initiative. Report from roundtable held at Bank of America Merrill Lynch (BoAML) on 27 June 2012, London. Note that this differs from political risk insurance, which addresses discriminatory behavior by governments.
[91] DG CLIMA, Shifting Private Finance towards climate-friendly investments, 2015.

6 Conclusions

6.1 Overall conclusions

- Even taking into account the specific Belgian federal structure and the difficulties to work smoothly together between the federal and regional levels in fields like climate change, there is still a long way to go in tracking climate finance. At nearly all levels (in the public and private sector) the necessary **coordination and reporting mechanisms are not yet in place**. The lack of data has obliged the researchers to use bottom up (interviews and reports/documents from individual companies and institutions), top down methods (specialised and statistical databases) and assumptions (starting from a limited set of data). As such, we can conclude that the current data gaps hamper the understanding of climate finance effective.
- It was not a surprise to see that **climate finance flows mostly to climate mitigation** (84% of the total amount) and secondly to climate services (15%). The share of climate adaptation investments is rather low (1%), taking into account that flood and river basin management is part of climate adaptation. Although It should be mentioned that this share is expected to increase in the following years, given the fact that climate adaptation plans are being adopted on regional and federal level and the relatively high share "Adaptation & Resilience" in corporate climate service activities (R&D and readiness phase).
- The **private sector is key:** corporations and households together are not only the biggest initiator of climate finance (66% of all final climate investments is originating from the private sector), they also finance it most of the time with their own equity (even 85% of the time for households). It should be mentioned though, that the public sector (national and EU) remains an important driver (grants, policy incentives, conc. loans) and actor (public investments) for climate finance as it is responsible for 34% of total climate finance. A third of the total public climate finance are investments sourced by (semi)-public budgets.
- Debt (provided by commercial banks) and equity are thus by far the most used instruments to finance investments in climate projects. In 35% of the time, the instruments used for climate finance come from a public body.

6.2 Specific conclusions for the Energy Generation & Infrastructure sector

- The deployment of **renewable energy sources** and combined heat and power represented in 2013 the **largest part of the low carbon investments** in Belgium. These technologies substantially contribute to the climate objectives, as they allow to significantly reduce the inland consumption of fossil fuels and hence the related GHG emissions.
- **Households have become a major actor in the transition towards a low carbon energy supply**, on the one hand by investing themselves massively in new devices based on renewable energy sources due to the green certificates policies (photovoltaics, solar boilers, heat pumps) and in energy efficiency (insulation of houses, high efficient appliances), and on the other hand by co-financing investments (e.g. wind energy projects) via specific cooperative associations.
- The trend to more **decentralised and small scale low carbon energy generation** has also been reinforced by large investments of non-residential energy end users (agriculture, commercial and industrial enterprises) in renewable energy sources and CHP. The utilities are not the dominant investor any more in new low carbon energy supply assets, and the energy landscape has become much more fragmented and diversified.

- In order to reach the long term climate objectives, substantial additional investments in low carbon energy supply and grid infrastructure will be needed. The current policies and market design will not allow to trigger the required investment level; policy changes (e.g. review of ETS in order to have a substantially higher CO_2-price) will hence be necessary but major policy choices should preferably be determined at EU level in order to maximise their effectiveness and to avoid competition and market distortions.
- **Electricity and gas grid operators** also play a major role in the transition towards a low carbon energy supply. The electricity grids have to be extended and reinforced in order to allow the connection and injection of renewable energy sources while their operating and communication systems have to be upgraded in order to allow bi-directional flows on the grid.
- **Investments in renewable energy sources and combined heat and power** are in Belgium mainly **financed by the private sector** (indirectly recovered via a specific contribution on the electricity bill), with only a limited contribution from the public sector via loans (e.g. EIB for wind offshore), fiscal measures and grants.

6.3 Specific conclusions for the other Sectors

- **Supporting the incremental cost to reduce upfront investment** (and related risk) of energy efficiency measures is crucial to leverage private investments. In the buildings sector, agricultural sector and industrial sector, the importance of grants and policy incentives to leverage private investments in energy efficiency measures should not be underestimated – as indicated by the strong integration of the regional RUE grants, the Flemish Ecology Grant and the federal tax reduction for energy reduction measures.
- **Corporate organizations contribute to more than half of total climate finance.** Corporate organizations contribute to both climate mitigation and, to a lesser extent in the R&D and readiness phase of climate adaptation activities. Half of the corporate investments are made in energy generation. Corporate energy efficiency investments are mainly made in the industry sector.
- **Private investments by households are limited to energy generation, energy efficient retrofitting and energy efficient constructions**. Some minor investments are made in electric vehicles.
- **Transparent and stable public policy supporting schemes** are important to incentivise private climate finance. In the buildings sector, tax reduction, green loans and grants are being reformed in recent years. Some investments are not supported anymore, while support for other energy efficiency measures has increased.
- **The lack of alignment between regional and federal supporting schemes**, creates the possibility of over- and under subsiding of certain energy efficiency measures and makes standardization of the data gathering and reporting process impossible. Certain energy efficiency measures in the buildings sector (e.g. roofing insulation) are supported with both regional grants and a federal tax reduction. In Wallonia and Brussels, the green loan can be combined with REU grants. This makes estimation of the private investments very difficult.
- In the **industry sector, corporate climate finance is mainly leveraged by (voluntary) energy reduction programs**, the EU ETS and possible financial or fiscal support for energy efficiency investments.
- **Climate adaptation investments represents a minor share of total climate finance**. In 2013, the investments in climate adaptation contributed to less than 1% of total climate finance. Climate

adaptation activities are mainly financed by public organizations and the different adaptation actions plans were still in the adoption phase. If we take climate adaptation services in considerations, the total share of climate adaptation activities amount 8% of total climate finance. This is a significant difference, meaning that many climate adaptation activities are situating in the readiness phase (R&D, consultancy, engineering).

Annex 1: Definition Climate mitigation MDBs

1. **Demand-side, brownfield energy efficiency**[21]
   - 1.1. Commercial and residential sectors (buildings)
     - 1.1.1. Energy-efficiency improvement in lighting, appliances and equipment
     - 1.1.2. Substitution of existing heating/cooling systems for buildings by cogeneration plants that generate electricity in addition to providing heating/cooling[22]
     - 1.1.3. Retrofit of existing buildings: Architectural or building changes that enable the reduction of energy consumption
     - 1.1.4. Waste heat recovery improvements
   - 1.2. Public services
     - 1.2.1. Energy-efficiency improvement in utilities and public services through the installation of more efficient lighting or equipment
     - 1.2.2. Rehabilitation of district heating systems
     - 1.2.3. Utility heat loss reduction and/or increased waste heat recovery
     - 1.2.4. Improvement in utility-scale energy efficiency through efficient energy use and loss reduction.
   - 1.3. Agriculture
     - 1.3.1. Reduction in energy use in traction (e.g. efficient tillage), irrigation and other agricultural processes
   - 1.4. Industry
     - 1.4.1. Industrial energy-efficiency improvements through the installation of more efficient equipment, changes in processes, reduction of heat losses and/or increased waste heat recovery
     - 1.4.2. Installation of cogeneration plants
     - 1.4.3. More efficient facility - replacement of an older facility (old facility retired)
2. **Demand-side, greenfield energy efficiency**[23]
   - 2.1. Construction of new buildings
     - 2.1.1. Use of highly efficient architectural designs or building techniques that enable the reduction of energy consumption for heating and air conditioning, exceeding available standards and complying with high energy efficiency certification or rating schemes
3. **Supply-side, brownfield energy efficiency**
   - 3.1. Transmission and distribution systems
     - 3.1.1. Retrofit of transmission lines or substations to reduce energy use and/or technical losses, excluding capacity expansion
     - 3.1.2. Retrofit of distribution systems to reduce energy use and/or technical losses, excluding capacity expansion
     - 3.1.3. Improving existing systems to facilitate the integration of renewable energy sources into the grid
   - 3.2. Power plants
     - 3.2.1. Renewable energy power plant retrofits
     - 3.2.2. Energy-efficiency improvement in existing thermal power plant
     - 3.2.3. Thermal power plant retrofit or replacement [24]to fuel; switch from a more GHG-intensive fuel to a different, less GHG-intensive fuel type[25]
     - 3.2.4. Waste heat recovery improvements
4. **Renewable Energy**
   - 4.1. Electricity generation, greenfield projects
     - 4.1.1. Wind power
     - 4.1.2. Geothermal power
     - 4.1.3. Solar power (concentrated solar power, photovoltaic power)
     - 4.1.4. Biomass or biogas power that does not decrease biomass and soil carbon pools

[21] The general principle for brownfield energy efficiency activities involving substitution of technologies or processes is that (i) the old technologies are substituted well before the end of their lifetime and the new technologies are substantially more efficient, or (ii) new technologies or processes are substantially more efficient than those normally used in greenfield projects

4.1.5. Ocean power (wave, tidal, ocean currents, salt gradient, etc.)
4.1.6. Hydropower plants only if net emission reductions can be demonstrated

4.2. Transmission systems, greenfield
4.2.1. New transmission systems (lines, substations) or new systems (e.g. new information and communication technology, storage facility, etc.) to facilitate the integration of renewable energy sources into the grid

4.3. Heat production or other RE applications, greenfield or brownfield projects
4.3.1. Solar water heating and other thermal applications of solar power in all sectors
4.3.2. Thermal applications of geothermal power in all sectors
4.3.3. Thermal applications of sustainably-produced bioenergy in all sectors, including efficient, improved biomass stoves
4.3.4. Wind-driven pumping systems or similar

5. Transport

5.1. Vehicle energy efficiency fleet retrofit
5.1.1. Existing vehicles, rail or boat fleet retrofit or replacement (including the use of lower-carbon fuels, electric or hydrogen technologies, etc.)

5.2. Urban transport modal change
5.2.1. Urban mass transit
5.2.2. Non-motorised transport (bicycles and pedestrian mobility)

5.3. Urban development
5.3.1. Integration of transport and urban development planning (dense development, multiple land use, walking communities, transit connectivity, etc.), leading to a reduction in the use of passenger cars
5.3.2. Transport demand management measures to reduce GHG emissions (e.g. speed limits, high-occupancy vehicle lanes, congestion charging/road pricing, parking management, restriction or auctioning of license plates, car-free city areas, low-emission zones)[26]

5.4. Inter-urban transport and freight transport
5.4.1. Improvement of general transport logistics to increase energy efficiency of infrastructure and transport, e.g. reduction of empty running
5.4.2. Railway transport ensuring a modal shift of freight and/or passenger transport from road to rail (improvement of existing lines or construction of new lines)
5.4.3. Waterways transport ensuring a modal shift of freight and/or passenger transport from road to waterways (improvement of existing infrastructure or construction of new infrastructure)

6. Agriculture, forestry and land use

6.1. Afforestation and reforestation
6.1.1. Afforestation (plantations) on non-forested land
6.1.2. Reforestation on previously forested land

6.2. Reducing emissions from the deforestation or degradation of ecosystems
6.2.1. Biosphere conservation projects (including payments for ecosystem services)

6.3. Sustainable forest management
6.3.1. Forest management activities that increase carbon stocks or reduce the impact of forestry activities

6.4. Agriculture
6.4.1. Agriculture projects that do not deplete and/or improve existing carbon pools (reduction in fertilizer use, rangeland management, collection and use of bagasse, rice husks, or other agricultural waste, low tillage techniques that increase carbon contents of soil, rehabilitation of degraded lands, etc.)

6.5. Livestock
6.5.1. Livestock projects that reduce methane or other GHG emissions (manure management with biodigestors, etc.)

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7.2. Treatment of wastewater if not a compliance requirement (e.g. performance standard or safeguard) as part of a larger project including the reduction of methane emissions
7.3. Waste recycling projects that recover or reuse materials and waste as inputs into new products or as a resource

8. Non-energy GHG reductions

8.1. Industrial processes
8.1.1. Reduction of GHG emissions resulting from industrial process improvements and cleaner production (e.g. cement, chemicals)
8.2. Air conditioning and cooling
8.2.1. Retrofit of existing industrial, commercial and residential infrastructure to switch to cooling agent with lower global warming potential
8.3. Fugitive emissions and carbon capture
8.3.1. Carbon capture and storage projects (including enhanced oil recovery)
8.3.2. Reduction of gas flaring or methane fugitive emissions in the oil and gas industry
8.3.3. Coal mine methane capture

9. Cross-sector activities and others

9.1. Policy and regulation
9.1.1. National mitigation policy/planning/institutions
9.1.2. Energy sector policies and regulations (energy efficiency standards or certification schemes; energy efficiency procurement schemes; renewable energy policies)
9.1.3. Systems for monitoring the emission of greenhouse gases
9.1.4. Efficient pricing of fuels and electricity (subsidy rationalisation, efficient end-user tariffs, and efficient regulations on electricity generation, transmission, or distribution),
9.1.5. Education, training, capacity building and awareness raising on climate change mitigation/sustainable energy/sustainable transport; mitigation research
9.2. Energy audits
9.2.1. Energy audits for energy end-users, including industries, buildings, and transport systems
9.3. Supply chain
9.3.1. Improvements in energy efficiency and GHG reductions in existing product supply chains
9.4. Financing instruments
9.4.1. Carbon markets and finance (purchase, sale, trading, financing, guarantee and other technical assistance). Includes all activities related to compliance-grade carbon assets and mechanisms, such as Clean Development Mechanism (CDM), Joint Implementation (JI), Assigned Amount Units (AAUs), as well as well-established voluntary carbon standards like the Verified Carbon Standard (VCS) or the Gold Standard.

9.4.2. Renewable energy and energy efficiency financing through financial intermediaries or similar (e.g. earmarked lines of credit; lines for microfinance institutions, cooperatives, etc.) [27]

9.5. Low-carbon technologies
9.5.1. Research and development of renewable energy or energy efficiency technologies
9.5.2. Manufacture of renewable energy and energy efficiency technologies and products
9.6. Activities with greenhouse gas accounting
9.6.1. Any other activity not included in this list for which the results of ex-ante greenhouse gas accounting (undertaken according to commonly agreed methodologies) show emission reductions that are higher than a commonly agreed threshold [28]

Annex 2: Overview of the Belgian climate mitigation activities by the Energy generation and Infrastructure sector

Methodology and research boundaries for the evaluation of the Energy generation and infrastructure sector

Topic	Stakeholder(s)	Incr. cost vs Cap. invest	Climate related /specific.	Inst
RES-E (incl. CHP), RES-T and RES-H	Public budgets	Incr. cost	Climate-specific	Gra
	corporate	Capital invest.	Climate-specific	Gra
Energy infrastructure (TSO & DSOs)	Semi-public	Incr. cost	Climate-related	Pub
Revenues from energy-related taxes	Public budgets	-	-	Rev

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS
1. Investments in RES-E (including CHP), RES-T and RES-H			
Investments in RES & CHP	Corporate (all sectors) **1.790,02** Households & S.M.E.'s **429,77** Public support **451,4**	2013	**Step 1. The share of investments in new capacity for the different RES-E and CHP technologies in 2013 is estimated.** - Based on the commissioned capacity in 2013 and 2014 and the average duration of construction (2 years), the installed capacity for the different RES-E and CHP installations is estimated. - Based on the available information of the standard investment cost (EUR/kW) for the different technologies and the estimated installed capacity in 2013, the investment in new capacities is estimated - Based on VEA reports and expert interviews (ODE), most RES-E and CHP investments are financed 80% debt and 20% equity, except for smaller solar PV installations (100% equity). For offshore wind power the financial structure (30% equity, 70% debt) is based on a CREG study. **Step 2. The yearly maintenance cost for RES-E and CHP is estimated** - Based on the cumulative installed capacity (end 2012) and the available data on the average maintenance cost per technology (EUR/kW), the maintenance cost for 2013 is estimated. - The assumption is made that new installations commissioned in 2013 and small solar PV installations did not undergo maintenance in 2013. - The assumption is made that maintenance is financed 100% equity. **Step 3. The yearly investment in RES-H installations are estimated** - Based on the available information, the total yearly investment in RES-H is estimated as the total investment in heat pumps and solar thermal installations. - The assumption is made that heat pumps and solar thermal installations are financed 100% equity. **Step 4. The total investment in biofuels (RES-T) is estimated** - Based on the available information of total investments in biofuels (bioethanol and biodiesel) in 2006-2015, the annual investment is estimated to be 10% of total investments **Step 5. Ratio equity and debt of the RES-T investment is estimated** - Based on expert interview with ODE (the Flemish sector organisation for sustainable energy) the ratio is estimated to be 25% equity and 75% debt. **Step 6. Public support is calculated based on the different supporting schemes.** - Based on the information received from Flanders Enterprise (Ecology Grant), Flemish Government Agriculture and Fisheries (VLIF-support), the Federal government (tax deduction energy reduction measures). The total public support for renewable energy is estimated. The estimation is made that the public support is are integrated in the total investments calculated based on the commissioned capacity (step 1). Therefor the corporate and residential investments are calculated by decreasing the total investments with the public support, based on the targeted actors of the support.
2. Investments in energy infrastructure (climate-related only)			
Investments in energy infrastructure (climate-related)	Public investments **222,02**	2013	**Step 1. The public investments in electricity and gas grid infrastructure are estimated** - Based on expert interviews with the different distribution net operators and transmission net operators, the climate-related investments are calculated. The investments considered are based on the integration of decentralised renewable energy on the electricity grid and the connectivity extension for natural gas to replace heating oil.
3. Revenues from energy-related taxes			
Revenues from energy-related taxes	Government revenues **4.800,00**	2012	**We only include the energy-related taxes as government revenues from taxation**

Annex 3: Overview of the Belgian climate mitigation activities by the Industry sector

Methodology and research boundaries for the evaluation of the Industry sector

Topic	Stakeholder(s)	Incr. cost vs Cap. invest	Climate related /specific.	Instrument(s)
Industrial Energy Efficiency improvements	Public budgets	Incr. cost	Climate-related	Grants
	corporate	Capital invest.	Climate-related	20% Equity , 80% debt
Government revenues regarding EU ETS	Public budgets	-	-	Revenues public government
Carbon offset finance regarding EU ETS	Corporate	Incr. cost	Climate-related	Carbon offset finance

Measures and assumptions used for the evaluation of finance in the Industry sector

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
1. Industrial Energy Efficiency Improvements				
Industrial investments in Energy Efficiency	Public support (FL) **16,21** Corporate **226,91**	2013, Based on 2012,2013	**Step 1. The public support and corporate financing for Flanders is calculated** - Based on expert interview with Enterprise Flanders, the public support and corporate financing of energy efficiency investments are calculated for the **'Ecology Grant and Strategic Ecology Grant'.** Since the supported EE investments are directly related to energy reduction, the total investment (eligible investment cost and public support) is included. - The assumption is made that the ecology grant of Enterprise Flanders covers the EE investments made in Flanders as they are available for the industry (S.M.E.'s and companies participating in the audit (0,1PJ - 0,5PJ) or benchmark agreement. We received information (confidential) of the Flemish Verification office Benchmarking (VBBV) concerning the investments related to energy reduction in the Flemish Audit covenant (apr. EUR 24 million). As the participating companies of the audit covenant are also supported by the Ecology Grant, these investments are not aggregated with the grants to avoid double counting. **Step 2. The assumption is made that the agreements leveraged by the *Accords de Branche* program cover the Walloon region** - The investments in improvements, reported by the Walloon government concerning the *Accords de Branche 1st generation*, are estimated to cover the whole Walloon region since the branch agreement includes 85% of the whole energy consumption in the Walloon government and no other supporting schemes that leverage EE investments in the Walloon region are identified. - The total investment is considered, as they are defined as 'improvement measures' in an energy reduction program. This is also consolidated by comparing the investment (€) per energy consumption reduction (GJp) with the available information of the Flemish audit covenant. These investments are roughly the same.	- Annual report 2013 Flanders Enterprise - Annual report 2013 Benchmark agreement - Annual report 2013 Audit agreement - Expert interview Verification office Benchmarking Flanders (VBBV) - Expert interview Flanders Enterprise - Report Walloon government concerning the branch agreement 1st generation (Accords de Branche 2005-2013)
2. Government revenues and carbon offset finance regarding EU ETS				
Government revenues regarding EU ETS	Public revenues **151,41**	2013	**Step 1. The public revenues of auction of the national emission rights are calculated** - Based on the auction details of the EU Allowance (EUA) primary market auction on the EEX Emission market, the national (Belgium and Flanders) revenues are calculated.	- Emission Spot Primary Market Auction Report 2013, EEX - Flemish Climate Policy Plan 2013-2020
Carbon offset finance regarding EU ETS	Corporate **34,11** Public **26,15**	2013	**Step 1. The allowances bought by the industry are calculated** - Based on the 2013 compliance table of the Belgian National greenhouse gas registry, reporting the verified emissions, free allowances and surrendered allowances, the EUA (ton CO2) bought by the industry are calculated as the difference between the surrendered allowances and the free allowances in 2013.	- Summary Compliance table of 2013-2020, Belgian national greenhouse gas registry - Expert interview FPS Health, Food Chain Safety & Environment

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
			- The assumption is made that the allowances are balanced each ear, meaning industrial companies with free allowances higher than the verified emissions traded the remaining allowances in the same year. **Step 2. The carbon offset finance by the industry are estimated** - Based on an average price per ton CO2 (EUR 4,5 per ton CO2), the carbon offset finance is calculated by multiplying the bought allowances and the average carbon price of 2013 - The assumption is made that the interfering of investors and commercial institutions in Belgium buying EAU's on the Belgian market is insignificant, therefore only the allowances trading of EU ETS industrial companies are included. **Step 3. The carbon offset finance by the public organisations are estimated** - Based on expert interview with the FPS Health, Food Chain Safety & Environment, the total carbon offset finance of public organisations are estimated **Note: the Carbon offset finance related to the EU ETS program are considered to be an OUTFLOW, and therefore not included as an investment.**	

Annex 4: Overview of the Belgian climate mitigation activities by the buildings sector

Methodology and research boundaries for the evaluation of the buildings sector

Topic	Stakeholder (s)	Incr. vs Cap. cost	Climate related /specific.	Instrument(s)
Commercial and residential sectors -Residential electrical appliances, electronics and equipment	Public budgets	incr. cost	Climate related	Grants
	Households and SME's	incr. cost	Climate related	Equity
Retrofitting of existing buildings	Public budgets	incr. cost	Climate related	Grants, policy incentives and concessionary loans
	Households	incr. cost	Climate related	Equity and concessionary loans
	Corporate	incr. cost	Climate related	Equity
	Public budgets	incr. cost	Climate related	Public investments
New construction, energy efficient	Public budgets	incr. cost	Climate related	Policy incentives
	Households	incr. cost	Climate related	30% equity , 70% debt
Thermal and electrical renewable energy, construction and existing buildings	Public budgets	cap. invest.	Climate specific	Grants and policy incentives
	Households	cap. invest.	Climate specific	Equity
	Corporate	cap. invest.	Climate specific	Equity

Measures and assumptions used for the evaluation of finance in the buildings sector

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
1. Electric appliances, electronics and equipment				
Residential electrical appliances, electronics and equipment	Public support **0,28** Households and SME's **120,95**	2013 based on 2011 study	**Step 1. The average share per efficiency class and relative incremental cost was calculated** - The average of the shares of units sold per efficiency class (Ecodesign) for refrigerators and washing machines of 2010 are assumed to represent the average share per efficiency class for all major domestic appliances – since a) they represent almost 50% of total EU MDA market value in 2012 and b) the market shares of 2010 do not differ significantly with those of EU in 2012 – *other parameters considered: maturity of the market, no additional supporting schemes with significant impact on sales, no significant technology improvements.* - The relative incremental cost is estimated based on the available information of the average cost per efficiency class for refrigerators and washing machines (2010), which is gathered by market research of GfK. The average incremental cost per step of efficiency class (between A and A+ and A+ and A++) is used to calculate the 'indexed cost' per efficiency class (with A = 100 and A+ = 128 and A++ = 163) for the MDA market in Belgium. The assumption is made that the average incremental cost (28%) per step of the efficiency class is also representable for 2013, based on the same parameters as stated above and based on the fact that we did not use the absolute value of the incremental cost but the relative. Which means that if the total price of the market should have decreased, the relative incremental cost would decrease also. **Step 2. The average weighted market share was calculated** - The average weighted market share was calculated by multiplying the average market share of the unit sold for refrigerators and washing machines with the indexed unit cost per efficiency class. **Step 3. The sales per efficiency class were calculated for major domestic appliances** - The sales per efficiency class were estimated by dividing the total sales (€) based on the GfK TEMAX® for Belgium in 2013 with the average weighted market share. **Step 4. The total incremental cost of energy efficiency in major domestic appliances was calculated** - Based on the calculated sales and the relative incremental cost per efficiency class, the total incremental cost was estimated as the sum of the incremental cost for efficiency A+ and A++ compared to A. **Note: the incremental cost is calculated with reference A (=average) instead of B/C (=minimum). We did not compare with the minimum standards, which is the general methodology in this study, as the Ecodesign labelling is considered to be a success and is well implemented, with over 90% of sales (units) are A, A+ and A++(+) appliances. The incremental cost amount 11% of total sales for MDA in Belgium.**	- Study on the Competitiveness of the EU electrical and electronic goods markets with a focus on pricing and pricing strategies", report by Ecorys, calculations based on GfK data, 2011 - Results of the GfK TEMAX® Belgium for the third quarter of 2013, GFK, November 20th 2013 - Results for GfK TEMAX® Belgium for the third quarter of 2014, GFK, November 18th 2014 - Expert Interview Flemish Energy Agency, discount for residential major appliances 2013 - Evaluation of the Energy Labelling Directive and specific aspects of the Eco design Directive - Background report I: Literature review

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
2. Retrofitting of existing buildings, energy efficiency				
Retrofitting of existing buildings	Public support **495,42** Households **522,11** Corporations **83,83** Public investors **47,49**	2012-2014 based on 2013-2014 data	**Step 1. The available data about EE retrofitting was gathered.** - The federal tax reduction for 'energy saving measures' is estimated to be 51% of total tax reduction, based on expert interview with the FPS Finances (based on the share of declarations EE/renewable energy received from the FPS Finances). This is considered to be public support for EE measures[92]. - The REU grants and green loans (concessionary loans) of the regions are retrieved from the annual reports of the three regions and interviews with VEA and BIM/IBGE. For the Walloon government, the evaluation of the 2nd Marshall Plan (SPW) was used. - The assumption is made that the REU grants and green loans cover the EE-investments for retrofitting made by households, corporates and public organisations. This assumption is based on the fact that the REU grants are the most comprehensive grants available and support insulation, relighting, investments after energy audit, etc. The green loans and REU grants are both regionally governed (the same actors are involved) and often combined, this means that the possibility of double counting is eliminated. The tax reduction for 'energy saving measures' is granted by the Federal government and supports the same investments as the REU grants. This means the private investments leveraged by the tax reduction are not taken into account. - The renovation grant and the share of increased corporate tax reductions that is related to energy saving investments are not taken into account as there is no information available about the EE-related share . The FRGE loans are not calculated based on the fact that there is no aggregated information available about the loans. **Step 2. The obtained amount was split into public support and leveraged investment.** - The public support amount the regional REU grants the share of national tax reduction concerning energy reduction measures (income 2012) that is related to energy efficiency and the zero interest-rate financing of the green loans in Brussels and Wallonia. The zero interest rate financing (public support) of the green loans of Wallonia (Ecopack) and Brussels (0% JKP) are calculated based on the formula: $K_n = K_0 * (1 + i)^n$ with K_n = total cost of loan, K_0 is granted loan, **i** is interest rate (based on OLO values of average duration of the loans) and **n** is average duration of the loans. *For the green loan of Brussels, the 'granted loans' are considered K_0 and K_n is calculated, for the Walloon green loan, the 'engagements of SPW' are considered to be K_n and K_0 is calculated.* K_n-K_0 is considered to be public support for the concessionary loans. - For the REU grants, the private investments leveraged by the REU grants are estimated based on interviews with VEA (Flanders) and IBGE (Brussels). It is	- Annual report 2013 Flemish Energy Agency - Annual report 2013 SWCS - Annual report 2013 Credal - Federal Government - Inventory of the federal fiscal expenses 2007-2012 and information of the declarations received from the FPS Finances. - Evaluation of the 2nd Marshall Plan (SPW) - Annual report 2013 BIM/IBGE - Annual report 2013 Eandis - Annual report 2013 Infrax - Annual report 2013 ORES - Expert review Flemish Energy Agenc - Expert review BIM/IBGE - Expert review FPS Finances

[92] The tax reduction for 'energy saving measures' are gradually being discontinued since 2012, which creates a potentially significant increase in tax reduction applications, the total amount of expenses of the Federal government are compared with the amount in 2011 and 2010, which are both higher but are in the same range – which makes the information of 2012 representable.

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
			estimated that of every EUR 1 of public support EUR 4 of private/public investments are leveraged for both Flanders and Brussels. The assumption is made that the same ratio can be used for Walloon, based on the fact that a) the same types of measures are supported and b) the REU grants are similar: fixed amount per technique (and not % of investments) and similar amount of support per EE measure. **Step 3. The leveraged investments is split into investments made by household, corporate and public investors** - Based on interviews with IBGE and VEA, the division in investments sourced by households, corporates and public organisations for the regional REU grants is made. The concessionary loans are for low-income households only. - *We assume that the total private expenses are covered by the REU grants and green loans and do not make an estimation of private expenses based on the tax reduction - based on the risk of double counting between different levels of government (regional v.s. federal government).*	
3. New construction, energy efficient				
Construction of new residential buildings	Public support **3,64** Households **126,08**	2012	**Step 1. The average energy efficiency investment per house by E-level was estimated** - The average energy efficient investment for residential buildings is estimated as the incremental cost per residential house or apartment related to the minimum required E-level (E70 in 2012). - The incremental cost is based on data of Bouwunie and Qubo on the total building cost per E-level of semidetached houses (E100, E70, E50 and E30). The incremental cost for E60,E40, E20 and lower than E20 are extrapolated. The assumption is made that this incremental cost is representable to estimate the incremental cost for buildings in the three regions based on a) the semidetached houses will out-balance the lower investments for small houses and higher incremental cost for apartments, b) the implemented techniques, building prices and regulation (EU's EPBD implementation) are similar and c) the overall building market aspects do not differ significantly in the different regions. **Step 2. Total incremental cost for energy efficient construction was estimated for Flanders** - Based on the incremental cost per E-level per semidetached house and the total submitted EPC-declarations for 2012 per E-level for residential houses and apartments, the total incremental cost for energy efficient construction was calculated by multiplying the average incremental cost per E-level (E60 and lower) with the related EPB-declarations. The assumption is made that the EPB declaration (2012) is submitted in the same year as the construction is built. **Step 3. The incremental cost for Brussels and the Walloon region was estimated.** - The assumption is made that the share of the different E-levels of the EPB declarations are the same in Brussels and Walloon than Flanders, since all regions implemented the EU' EPB Directive and the building market is not significantly different in the three regions. In new buildings, the E-level is related to the	- EPB - Figures and statistics 2006-2014, Flemish energy Agency (2015) - Practical and economic evaluation of airtightness concepts in wood and massive constructions, University of Gent (2013) - Flemish tax discount (households) based on interview with the Flemish Energy Agency - Federal Government - Inventory of the federal fiscal expenses 2007-2012 - Statistics Federal Government - Building permits per year

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
			construction year and the type of building (semi-detached, detached house, apartments,…). - Based on the building permits (total buildings) for the three regions and the ratio of building permits v.s. EPB declarations in Flanders, the incremental cost is estimated for Brussels and the Walloon region following the same methods as described in **Step 2.**	
4. Thermal and electrical renewable energy, construction and existing buildings				
Thermal and electrical renewable energy	Public support **328,12** Households & S.M.E's **429,77**	2012-2013	**See Annex 2 - investments in RES and CHP** **Note: the investments are also included in Annex 1 (RES and CHP for Households & SME's). In the climate-finance diagram, these investments are only counted for energy generation infrastructure and not for EE-related investments in the Building sector (no double counting)**	- Inventaris hernieuwbare energiebronnen Vlaanderen 2005-2013 - K. Jespers, K. Aernouts, W. Wetzels - Referentietaak i.o.v. Vlaamse regering 2015/TEM/R/0053 -Februari 2015 - BILAN ENERGETIQUE DE LA WALLONIE 2013 - Bilan de production électrique et de transformation, de la cogénération et des renouvelables - Janvier 2015 - Réalisé par ICEDD asbl pour le compte du Service Public de Wallonie - Statistieken website Apere - Federal Government - Inventory of the federal fiscal expenses 2007-2012 - Annual report Flemish Agency Enter - Expert interview Enterprise Flanders - Expert interview Federal Governement

Annex 5: Overview of the Belgian climate mitigation activities by the transport sector

Methodology and research boundaries for the evaluation of the transport sector

Topic	Stakeholder(s)	Incr. cost vs Cap. investment (%)	Climate related /specific.	Instrument(s)
Vehicle energy efficiency fleet retrofit	Public budgets	incremental cost	Climate specific	Government policy and grants
	Households	Capital cost	Climate specific	100% Equity
	Corporate	Capital cost	Climate specific	100% Equity
Urban transport modal change- Urban mass transit	Public budgets	incremental	Climate related	Government investment
Urban transport modal change- Non-motorized transport	Public budgets	incremental	Climate related	Grants
	Corporate	Capital investment	Climate related	100% Equity
Urban Development	Public budgets	incremental cost	cimate related	Government investment
Inter-urban transport and freight transport	Public budgets	incremental cost	cimate related	Government investment
	Corporate	Capital investment	climate related	Government investment
Investment in Energy Efficient Lighting	Public budgets	incremental cost	cimate related	Government investment
	Corporate	incremental cost	cimate related	Government investment

Measures and assumptions used for the evaluation of finance in the transport sector

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
1. Vehicle energy efficiency fleet retrofit				
Investment in LNG/CNG stations	Public Support **0,65** Corporate **4,13**	2012	**Step 1. The yearly investment in LNG/CNG is estimated.** - The investments in 2012 are estimated to 25% of total investment for the period 2012-2015. - The assumption is made that the investments are spread equally over the period (4 years), since no specific data about investments per year are available.	-Expert interview: natural gas association KVBG/ARGB
Investment in Electric Vehicles and charging stations	Public support **4,41** Households **1,84** Corporations **13,49**	2012	**Step 1. The public support, residential and corporate investments in electric vehicles and charging stations for households are estimated.** - Based on the residential tax declarations (2012), the public support for electric vehicles and charging stations is estimated. For households, the tax reduction in 2013 (investments in 2013) was zero - Based on the registered electric cars (only new cars are considered), the incremental cost, based on input of FPS Health, Food Chain Safety & Environment and the average share of residential purchases (14%) and corporate purchases (86%), the investments in electric vehicles are calculated for households and corporations seperatly. **Step 2. Yearly corporate investment in charging station related to the Electric vehicles program with IWT and Flemish Living Lab was estimated** - The investments in 2012 are estimated to 20% of total investment for the period 2011-2015. - The assumption is made that the investments are spread equally over the period (5 years), since no specific data about investments per year are available.	-Expert interview: FPS Finance - Statistics of car registrations in Belgium (FPS Finance) - Expert interview FPS Health, Food Chain Safety & Environment - Evaluation of new alternative fuel vehicles (MIRA – Flanders)
2. Urban Transport Modal Change				
Investment in Public transport: capacity extension (excl. fleet)	Public investment **5,47**	2013	**Step 1. The investment directly related to modal shift are calculated.** - Only the investments related to capacity extension and increased connectivity are considered to as investments directly related to modal shift. Investments in ICT, safety, renovation of existing connections and infrastructure are not included. This is a significant stricter scope considered with the EIB/MDB's approach of including all investments. - Based on the available information in the annual report 2013 of TEC (Walloon), the investment in capacity extension is estimated based in the reported investments in new connectivity and extension of current connectivity. For MIVB (Brussels) the investment in capacity extension is estimated using the same share of total investments as the Walloon public transport (TEC – 2%) and the total investment of MIVB (EUR 206 million) based on the annual report 2013. - For De Lijn (Flanders), based on the activities reported in the annual report, most capacity extensions are still in (pre)feasibility phase and are not included.	-Annual report TEC 2013 -Annual report De Lijn 2013 -Annual report MIVB 2013

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
Investment in Public transport: sustainable fleet	Public investment **1,8**	2013	**Step 1. The public investment in capacity extension is estimated.** - The investments in public transport (busses) are only considered to be climate-specific if they perform better than the (European) standardization, being EURO VI engines for the purchased diesel busses. - Based on expert interviews, the assumption is made that only the purchasing hybrid busses can be included as being climate-specific investment, being the incremental cost of a hybrid bus compared to the EURO VI diesel busses. Based on the available information in the annual report (De Lijn), expert interview (TEC) and an article in Brussels.Nieuws (MIVB), the incremental investment in sustainable fleet is calculated for the purchased hybrid busses. 18 hybrid busses and EUR 100.000 incremental cost per bus.	-Expert interview TEC -Annual report De Lijn - Expert interview De Lijn -Brussels.Nieuws & management agreement MIVB - Expert interview MIVB
3. Non-motorized transport				
Sustainable commuter traffic and modal shift	Public support **11,12** Corporate **11,12**	**2012**	**Step 1. The private investment is estimated.** - Based on the annual budget of the Flemish 'Pendelfonds' and the average rate of project support (50%), the private investments are estimated.	-Expenditure budget of the Flemish Government 2012
4. Urban Development				
Investments in cycling mobility	Public investment NE		Investments in cycling mobility, related to modal shift are not estimated as there is no basis to make the division between commuter and recreational cycling paths nor extended connectivity and maintenance.	
5. Inter-urban transport and freight transport				
Investment in railway infrastructure: capacity extension	Public investment **398,6**		**Step 1. The public investment in capacity is calculated** - Only the investments related to capacity extension and increased connectivity are considered to as investments directly related to modal shift. Investments in ICT, safety, renovation of existing connections and infrastructure are not included. This is a more narrow scope compared with the EIB/MDB's approach of including all investments - Based on the annual report 2013 of Infrabel, the Belgium public company responsible for railway infrastructure, the investment in capacity extension is calculated. - Investments in capacity extension GEN, DIABLO and connectivity with different ports are a third of total investments made by Infrabel in 2013.	-Annual report 2013 Infrabel
Investment in railway fleet: capacity extension and sustainable fleet	Public investment **267,00**		**Step 1. The public investment in capacity extension (modal shift) and fleet modernisation is calculated** - Only the investments related to capacity extension to support modal shift and fleet modernisation are considered. The investments in modal shift (both capacity and fleet) are one third of total investments of the NMBS group (including Infrabel) in 2013.	-Investment planning 2013-2025 NMBS Group

PROGRAM/ MEASURE	VALUE (MILLION EURO)	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
Investment in inland waterway, related to modal shift	Public investment **64,47** Corporate **7,41**		**Step 1. The public and private investment in modal shift are calculated** - Based on information of the Brussels Expenditure budget, the investments to support the multimodal transport are considered. These investments are direct modal shift support and the full amount is included. - After expert interview with the Flemish inland waterway operators De Scheepvaart NV and Waterwegen en Zeekanaal NV and the Walloon Public Service DG02/DG06, both private and public investments related to modal shift (infrastructure and stimulating of inland waterway use), the investments to support modal shift are calculated.	-Expenditure budget Brussels 2013 -Expert interviews with Flemish inland waterway operators and Walloon Public service DG02/DG06
Investment in inland waterway, related to sustainable fleet	Public investment 0,50 Corporate **1,18**		**Step 1. The public and private investment in sustainable fleet are calculated** - Based on expert interview with the Flemish inland waterway operators De Scheepvaart NV and Waterwegen en Zeekanaal NV and the Walloon Public Service DG06, the private and public investments related to making existing fleet more sustainable are considered. - The full amount is included of both support of DG06 for modernisation of existing fleet (related to the environmental CCNR2 standard in the Walloon region) and the leveraged corporate investments as it are modernisations (thus full replacements) of existing motorisations.	-Expenditure budget Brussels 2013 -Expert interviews with Flemish inland waterway operators and Walloon Public service DG02/DG06

NOTE: modal shift and sustainable fleet of public transport, inter-urban transport and freight transport: As stated above, only investments in sustainable fleet (modernisation of existing fleet) and capacity extensions (infrastructure and supporting fleet) are considered to be directly related to Modal Shift. This is a narrow scope considered the scope used by MDB's and EIB. In total (for Infrabel and NMBS aggregated), the investments directly related to modal shift will be 28% (EUR 7.500 million of EU 25.000 million) considering the total investments of the 'investment planning of the NMBS group of 2013-2025'. This is a very strict limitation considered the statement of NMBS that "railway transport (as a sustainable transportation method) should contribute as much as possible to sustainable public transport and sustainable freight transport. The majority of investments sourced by railway transport are done from the modal shift perspective, in other words decreasing road transport and introducing public transport to travellers."

Annex 6: Overview of the Belgian mitigation climate activities by the Agriculture sector

Methodology and research boundaries for the evaluation of the Agriculture sector

Topic	Stakeholder(s)	Incr. cost vs Cap. invest	Climate related /specific.	Instrument(s)
Energy Efficiency measures to reduce energy consumption	Public budgets	Incr. cost	Climate-related	Grants
	Corporate	Capital invest.	Climate-related	20% Equity , 80% debt
Low-emission measures and infrastructure to reduce greenhouse gas emission	Public budgets	Incr. cost	Climate-related	Grants

Measures and assumptions used for the evaluation of finance in the Agriculture sector

PROGRAM/ MEASURE	VALUE	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
1. Energy Efficiency measures to reduce energy consumption				
Energy efficiency measures to reduce energy consumption	Public Support **5,22** Corporate (Wal* and Fla) **21,76**	2013	**Step 1. The public support and corporate investment for Flanders are calculated** - Based on expert interview with ILVO, the total share of grants for EE-measures and corresponding corporate investments are calculated. - The assumption is made that both support and private investments (subsidy eligible cost) are included, based on the type of measures supported (insulation, renovation of heating installation, energy screens,…) which are directly related to improve energy efficiency. - The assumption is made that the ILVO grants cover the investments made in Flanders by the agricultural sector. **Step 2. The corporate investment for Walloon region are estimated** - The assumption is made that the EE investments in the Walloon region are (in proportion) the same as in the Walloon region. The ratio on which the estimation of the investments in Wallonia is based, is the amount of companies in both regions, retrieved from statistics of the Federal Government. - The assumption is made that the investments in the Walloon region are 100% sourced from corporate actors and no public support, since there is no information available of possible supporting schemes in the Walloon region.	- Expert interview ILVO - Statistics Federal Government Concerning Agricultural Sector in Belgium
2. Low-emission measures and infrastructure to reduce greenhouse gas emission				
Low-emission measures and infrastructure to reduce greenhouse gas emission	Public support (Fla) **10,21** Corporate (Wal)* **1,63**	2013	**Step 1. The public support and investments in Flanders are calculated** - Based on expert interview with ILVO, the total share of grants for low-emission measures and infrastructure is calculated. - Based on the Flemish legislation, which obliges the installation of low ammonia emission infrastructure (e.g. stables, manure, etc). and the fact that the total investments related to low ammonia emission stables are also partly activity-based investments, only the public support is considered as climate-related. **Step 2. The corporate investments in the Walloon region are calculated** - Based on the judgement of the Walloon government *(Arrêté du Gouvernement wallon portant programme de réduction progressive des émissions de SO2, NOx, COVphot et NH3*), the assumption is made that the same efforts to reduce ammonia emission are also made in the Walloon region. The investments in low ammonia emission infrastructure are calculated based on the public support in Flanders (see above) and the ratio of livestock in both regions. - - The assumption is made that the investments in the Walloon region are 100% sourced from corporate actors and no public support, since there is no information available of possible supporting schemes in the Walloon region.	- Expert interview ILVO - National GHG inventory report 2013. - Arrêté du Gouvernement wallon portant programme de réduction progressive des émissions de SO2, NOx, COVphot et NH3 (M.B. 20.08.2004)
3. Manure management				

PROGRAM/ MEASURE	VALUE	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
Investments in manure management to reduce greenhouse gasses	Public support (FL) 0,08 Corporate (Wal)* 0,09	2013	**Step 1. The public support and investments in Flanders are calculated** - Based on expert interview with ILVO, the total share of grants for manure management is calculated **Step 2. The corporate investments in the Walloon region are calculated** - The assumption is made that the same efforts to reduce emission from manure management also made in the Walloon region. The investments in manure management are calculated based on the public support in Flanders (see above) and the ratio of cultivated agricultural land in both regions. - - The assumption is made that the investments in the Walloon region are 100% sourced from corporate actors and no public support, since there is no information available of possible supporting schemes in the Walloon region.	- Expert interview ILVO - Statistics Federal Government Concerning Agricultural Sector in Belgium - Arrêté du Gouvernement wallon portant programme de réduction progressive des émissions de SO2, NOx, COVphot et NH3 (M.B. 20.08.2004) -

*Since we did not receive data concerning Walloon programmes financially supporting the agricultural sector concerning energy efficiency, low-emission infrastructure or manure management, the total amount of investments derived (and extrapolated) from the Flemish supporting programme VLIF are considered as corporate investments for the Walloon region. This can be modified if the information of the Walloon government becomes available.

Annex 7: Overview of the Belgian climate adaptation activities

Methodology and research boundaries for the evaluation of the climate adaptation activities

Topic	Stakeholder(s)	Incr. cost vs Cap. invest	Climate related /specific.	Instrument(s)
Investments in water management and flood control	Public budgets	Incr. cost	Climate-related	Public Investment

Measures and assumptions used for the evaluation of finance in the climate adaptation activities

PROGRAM/ MEASURE	VALUE	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
1. Water management and flood control				
Investments in water management and flood control	Public investment **44,74**	2013	**The public investments are calculated based on expert interview with the Flemish waterway operators (NV De Scheepvaart & Waterwegen en Zeekanaal NV**	- Expert interview NV De Scheepvaart - Expert interview Waterwegen en Zeekanaal

Annex 8: Overview of the Belgian climate activities from other services

Methodology and research boundaries for the evaluation of the climate activities from other services

Topic	Stakeholder(s)	Incr. cost vs Cap. investment (%)	Climate related /specific.	Instrument(s)
1. Climate-specific and climate-related measures supported by European research and innovation programs	EU	-	-	Grants
	Public budgets	-	-	Public investment
	Corporate	-	-	100% Equity
2. Climate-specific and climate-related measures supported by national and regional research an innovation programs	Public budgets	-	-	Grants
	Corporate	-	-	100% Equity
3. Corporate Clime Services	Corporate	-	-	100% Equity

Measures and assumptions used for the evaluation of finance in climate activities from other services

PROGRAM / MEASURE	VALUE (MILLION EURO) EU contribution	National contribution*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
1. Climate-specific and climate-related measures supported by European research and innovation programs					
1.1. Climate-specific and climate-related measures supported by the **European Regional Development Fund** (ERDF) in Belgium					
Strategic Initiative Cluster – Adaptation to the Impacts of Climate Change (SIC adapt!)	0,02	0,03	2013*	**Step 1. The total EU contribution for Belgium is estimated** - The EU contribution is assumed to be equal for each country - Based on the available project information of the total EU contribution and the countries, the EU contribution for Belgium is estimated by dividing the total EU contribution by the number of countries involved. **Step 2. The annual EU contribution for Belgium is estimated** - The EU contribution is assumed to be equal each year - Based on the total EU contribution for Belgium and the project duration, the annual EU contribution for Belgium is estimated by dividing the total EU contribution for Belgium by the project duration. - We only include projects which were still active in 2013. - If the project duration is unknown, we assume that the project was active during the whole duration of the ERDF program (7 years) **Step 3. The national contribution was estimated** - Based on the maximum European project subsidy (40%), the annual national contribution was estimated. - We assume that each project had maximum project subsidy. This gives a rather conservative estimation of total national contribution. - We assume that the national contribution was 50% corporate (equity) and 50% public investments	Source: ERDF
Coastal Communities 2150	0,12	0,18	2013		
Ticket to Kyoto (T2K)	0,17	0,26	2013*		
The Clean North Sea shipping (CNSS) project	0,03	0,04	2013*		
The ANSWER (a North Sea Way to Energy-Efficient Regions) project	0,21	0,32	2013*		
Solar Flare project	0,10	0,15	2013*		
EMOVO	0,08	0,12	2013*		
The 'Hydrogen Region Flanders-South Netherlands' project	0,21	0,32	2013*		
Duurzame Zeehavens (Sustainable Seaports)	0,07	0,01	2013		
1.2. Climate-specific and climate-related measures supported by the **LIFE+ program** in Belgium					
BIOGASTIL - Integration of biogas production process into an existing biomethanisation plant	0,74	0,76	2013	**Step 1. The total EU contribution for Belgium is estimated** - The EU contribution is assumed to be equal for each country - Based on the available project information of the total EU contribution and the countries, the EU contribution for Belgium is estimated by dividing the total EU contribution by the number of countries involved.	Source: LIFE+

PROGRAM / MEASURE	VALUE (MILLION EURO) EU contribution	National contribution*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
AGICAL+ - Validation of an environmentally friendly system, combining CO2 capture and biofuel production based on algae culture for industrial exhaust application	0,57	0,61	2013	**Step 2. The annual EU contribution for Belgium is estimated** - The EU contribution is assumed to be equal each year - Based on the total EU contribution for Belgium and the project duration, the annual EU contribution for Belgium is estimated by dividing the total EU contribution for Belgium by the project duration. - We only include projects which were still active in 2013. - If the project duration is unknown, we assume that the project was active during the whole duration of the LIFE+ program (7 years) **Step 3. The national contribution was estimated** - Based on the maximum European project subsidy (44,5%), the annual national contribution was estimated. - We assume that each project had maximum project subsidy. This gives a rather conservative estimation of total national contribution. - We assume that the national contribution was 50% corporate (equity) and 50% public investments	
CLIM-WASTENER - Energy recovery system from landfill waste as a contribution to the fight against climate change	0,30	0,31	2013		
1.3. Climate-specific and climate-related investments supported by the **EIB** in Belgium					
Eldepasco Northwind offshore wind	(see Annex 2)	(see Annex 2)	2013	**EIB concessionary loans for offshore wind are taken into account for the renewable energy financing.**	Source: EIB
Eldepasco Northwind offshore wind	(see Annex 2)	(see Annex 2)	2013		
Eldepasco Northwind offshore wind	(see Annex 2)	(see Annex 2)	2013		
1.4. Climate-specific and climate-related measures supported by the **FP7 program** in Belgium					
ANIMALCHANGE - AN Integration of Mitigation and Adaptation options for sustainable Livestock production under climate CHANGE	0,07	0,07	2013	**Step 1. The total EU contribution for Belgium is estimated** - The EU contribution is assumed to be equal for each country - Based on the available project information of the total EU contribution and the countries, the EU contribution for Belgium is estimated by dividing the total EU contribution by the number of countries involved. **Step 2. The annual EU contribution for Belgium is estimated** - The EU contribution is assumed to be equal each year - Based on the total EU contribution for Belgium and the project duration, the annual EU contribution for Belgium is estimated by dividing the total EU contribution for Belgium by the project duration. - We only include projects which were still active in 2013.	Source: FP7 (DG RTD)
MARATHON - Make Rail The Hope for protecting Nature	0,11	0,11	2013		
CLIM-RUN - Climate Local Information in the Mediterranean region: Responding to User Needs	0,05	0,05	2013		
PEGASOS - Pan-European Gas-AeroSol-climate interaction Study	0,06	0,06	2013		

PROGRAM / MEASURE	VALUE (MILLION EURO) EU contribution	National contribution*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
AMPERE - Assessment of Climate Change Mitigation Pathways and Evaluation of the Robustness of Mitigation Cost Estimates	0,07	0,07	2013	- If the project duration is unknown, we assume that the project was active during the whole duration of the FP7 program (7 years) **Step 3. The national contribution was estimated** - Based on the maximum European project subsidy (50%), the annual national contribution was estimated. - We assume that each project had maximum project subsidy. This gives a rather conservative estimation of total national contribution. - We assume that the national contribution was 50% corporate (equity) and 50% public investments	
CGS EUROPE - Pan-European coordination action on CO2 Geological Storage	0,02	0,02	2013		
VEG-I-TRADE - Impact of climate change and globalisation on safety of fresh produce – governing a supply chain of uncompromised food sovereignty	0,38	0,38	2013		
REFRESH - Adaptive Strategies to Mitigate the Impacts of Climate Change on European Freshwater Ecosystems	0,05	0,05	2013		
PAST4FUTURE - Climate change - Learning from the past climate	0,06	0,06	2013		
CARBO-EXTREME - The terrestrial Carbon cycle under Climate Variability and Extremes – a Pan-European synthesis	0,03	0,03	2013		
COMBINE - Comprehensive Modelling of the Earth system for better climate prediction and projection	0,08	0,08	2013		
ICE2SEA - Ice2sea - estimating the future contribution of continental ice to sea-level rise	0,30	0,30	2013		
UncertWeb - The Uncertainty Enabled Model Web	0,09	0,09	2013		
RELCOM - Reliable and Efficient Combustion of Oxygen/Coal/Recycled Flue Gas Mixtures	0,10	0,10	2013		

PROGRAM / MEASURE	VALUE (MILLION EURO) EU contribution	National contribution*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
HETMOC - Highly Efficient Tubular Membranes for Oxy-Combustion	0,14	0,14	2013		
DEMOCLOCK - Demonstration of a cost effective medium size Chemical Looping Combustion through packed beds using solid hydrocarbons as fuel for power production with CO2 capture	0,10	0,10	2013		
RESPONSES - European responses to climate change: deep emissions reductions and mainstreaming of mitigation and adaptation	0,07	0,07	2013		
TREES4FUTURE - Designing Trees for the future	0,19	0,19	2013		
ECLAIRE - Effects of Climate Change on Air Pollution Impacts and Response Strategies for European Ecosystems	0,07	0,07	2013		
INGOS - Integrated non-CO2 Greenhouse gas Observing System	0,06	0,06	2013		
ISEFOR - Increasing Sustainability of European Forests: Modelling for Security Against Invasive Pests and Pathogens under Climate Change	0,10	0,10	2013		
FACCE ERA NET PLUS - "Food security, Agriculture, Climate Change ERA-NET plus"	0,03	0,03	2013		
LEANWIND - Logistic Efficiencies And Naval architecture for Wind Installations with Novel Developments	0,37	0,37	2013		
NANOBAK2 - Innovative and energy-efficient proofing/cooling technology based on ultrasonic humidification for high quality bakery products	0,06	0,06	2013		

PROGRAM / MEASURE	VALUE (MILLION EURO) EU contribution	National contribution*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
ECONADAPT - Economics of climate change adaptation in Europe	0,05	0,05	2013		
HELIX - High-End cLimate Impacts and eXtremes	0,11	0,11	2013		
POLIMP - Mobilizing and transferring knowledge on post-2012 climate policy implications	0,04	0,04	2013		
IMPRESSIONS - Impacts and risks from higher-end scenarios: Strategies for innovative solutions	0,12	0,12	2013		
CARBON CAP - Carbon emission mitigation by Consumption-based Accounting and Policy	0,07	0,07	2013		
LIMITS - Low climate IMpact scenarios and the Implications of required Tight emission control Strategies	0,09	0,09	2013		
CYCLED - Cycling resources embedded in systems containing Light Emitting Diodes	0,17	0,17	2013		
IMPACT2C - Quantifying projected impacts under 2°C warming	0,14	0,14	2013		
EMBRACE - Earth system Model Bias Reduction and assessing Abrupt Climate change	0,06	0,06	2013		
ECO2 - Sub-seabed CO2 Storage: Impact on Marine Ecosystems (ECO2)	0,07	0,07	2013		
ENDORSE - ENDORSE (ENergy DOwnstReam SErvices) - Providing energy components for GMES	0,16	0,16	2013		
MOLESOL - All-carbon platforms for highly efficient molecular wire-coupled dye-sensitized solar cells	0,07	0,07	2013		

PROGRAM / MEASURE	VALUE (MILLION EURO) EU contribution	National contribution*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
GHG EUROPE - Greenhouse gas management in European land use systems	0,04	0,04	2013		
CLIMSAVE - Climate change integrated assessment methodology for cross-sectoral adaptation and vulnerability in Europe	0,09	0,09	2013		
FUME - "Forest fires under climate, social and economic changes in Europe, the Mediterranean and other fire-affected areas of the world"	0,10	0,10	2013		
FIRESMART - FIRE-SMART. FOREST AND LAND MANAGEMENT OPTIONS TO PREVENT UNWANTED FOREST FIRES	0,04	0,04	2013		
PREFACE - Enhancing prediction of tropical Atlantic climate and its impacts	0,06	0,06	2013		
SEEMPubS - Smart Energy Efficient Middleware for Public Spaces	0,07	0,07	2013		
GREEN EMOTION - Green eMotion: Development and demonstration of a unique and user-friendly framework for green electromobility in Europe	0,16	0,16	2013		
NEED4B - New Energy Efficient Demonstration for Buildings	0,25	0,25	2013		
DIRECTION - Demonstration at European Level of Innovative and Replicable Effective Solutions for very Low Energy new Buildings	0,10	0,10	2013		
TOP WIND - Technology platform Operational Programme Wind	0,07	0,07	2013		

PROGRAM / MEASURE	VALUE (MILLION EURO) EU contribution	National contribution*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
HIPRWIND - "High Power, high Reliability offshore wind technology"	0,13	0,13	2013		
20PLµS - 20 percent efficiency on less than 100 µm thick industrially feasible c-Si solar cells	0,11	0,11	2013		
SUGAR - Silicon sUbstrates from an inteGrated Automated pRocess	0,17	0,17	2013		
REAPOWER - Reverse Electrodialysis Alternative Power Production	0,05	0,05	2013		
PROETHANOL2G - Integration of Biology and Engineering into an Economical and Energy-Efficient 2G Bioethanol Biorefinery	0,02	0,02	2013		
SUNLIBB - Sustainable Liquid Biofuels from Biomass Biorefining	0,10	0,10	2013		
GRID4EU - Large-Scale Demonstration of Advanced Smart GRID Solutions with wide Replication and Scalability Potential for EUROPE	0,16	0,16	2013		
ECOGRID EU - Large scale Smart Grids demonstration of real time market-based integration of DER and DR	0,30	0,30	2013		
HIPRWIND - "High Power, high Reliability offshore wind technology"	0,13	0,13	2013		
CAPIRE - Coordination Action on PPP Implementation for Road-Transport Electrification	0,05	0,05	2013		
TIBUCON - Self Powered Wireless Sensor Network for HVAC System Energy Improvement - Towards Integral Building Connectivity	0,07	0,07	2013		

PROGRAM / MEASURE	VALUE (MILLION EURO) EU contribution	National contribution*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
EnRiMa - Energy Efficiency and Risk Management in Public Buildings	0,06	0,06	2013		
Total Public contribution to EU programs	**13,05**		2013	Sum of the above EU and national contribution	

*The national contribution is calculated and includes both corporate and public contributions. To avoid double counting with the corporate climate services (based on LCEGS data), the corporate contributions are not included in the climate finance diagram and are only displayed here for illustrative purpose.

PROGRAM / MEASURE	VALUE (MILLION EURO) Public support	Corporate invest.*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
2. Climate-specific and climate-related measures supported by national and regional research and innovation programs					
2.1 Federal R&D budget					
Science for sustainable development - climate related projects	1,01	-	2013	This federal research program covers 8 priority themes, including 'Climate'. Only projects in the 'Climate' theme that were active in 2013 are included	- Website Belspo
BRAIN-be - climate related projects	2,23			Only projects that are climate related are included	- expert interview Belspo
2.2 Walloon R&D budget					
Marshal Plan 2.Green - budget dedicated to technological projects in which energy research can be carried out: - mobilizing program Erable - mobilizing program Reliable - mobilizing program R&D SolWatt - mobilzing program EnergyWall	121	-	2013	The Marshall plan 2. Green 2010-2014 was launched in 2010 with an overall budget of EUR 277 million. The share of the budget dedicated to technological projects (including energy) is approx. EUR 121 million.	- Website Portail de la Wallonie Plan Marshall 2, Vert
2.3 Brussels R&D budget					
R&D budget Brussels - Climate related	NE	-	2013	No information available about the R&D budget which is allocated to climate-related projects.	- Statistics Brussels: Annual expenses of the Brussels region (2013)
2.4 Flanders R&D budget and expenses					
2.4.1 Vlaams Agentschap Ondernemen (Enterprise Flanders)					

PROGRAM / MEASURE	VALUE (MILLION EURO) Public support	Corporate invest.*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
Virtual PowerPlant industrial area Lummen Zolder Zuid	0,43	0,12	2013	**Step 1. The corporate investment is estimated** - Based on the available information of government contribution and the maximum project subsidy of the different projects, the corporate investments are estimated - We assume that each project had maximum project subsidy. This gives a rather conservative estimation of the total contribution.	- Annual report 2013 Vlaams Agentschap Ondernemen - Expert interview Vlaams Agentschap Ondernemen
Electric power plant of the future: demand-side management of industrial consumers	0,37	0,09	2013		
ESKIMO fund: Stimulation of the ESCO-market	1,5	0,38	2013		
S.M.E. portfolio - support for training, coaching, advice and technology exploration - Energy related	0,63	0,18	2013		
2.4.2 Vlaams Energie Agentschap (Flemish Energy Agency)					
Impulse project: co-financing and monitoring of market introduction projects, demonstration projects and European projects.	5,64	-	2013	Assumption of the amount of R&D investments are based on the available data in the annual report 2013 of the Flemish Energy Agency and expert interview with the distribution net operators and the Flemish Energy Agency	- Annual report 2013 Vlaams Energie Agentschap - Expert interview Vlaams Energie Agentschap - Expert Interview Infrax
Energy scans (total)	4,90	-	2013		
Cogen (CHP) - expert center and meet-place	0,13	-	2013		
ODE: sector organisation Sustainable energy	0,09	-	2013		
Infrax: innovation budget	1,50	-	2013		
Infrax: ESCO feasibility studies and audits	4,60	-	2013		
Infrax: Smart Metering	6,10	-	2013		
2.4.3 ILVO (Institute for Agricultural and Fisheries Research)					
ILVO - research related to energy savings	0,50	0,35	2013	Assumption of the amount of energy related research investments is based on expert interview with ILVO	Expert interview ILVO
2.4.4 IWT					
ZF WIND POWER ANTWERPEN NV OCTOPUS	0,94	1,57	2013	**Step 1. The annual government contribution is estimated** - The annual government contribution is assumed to be equal each year	
3E NV SWiFT - Smart WInd Farm conTrol	0,18	0,30	2013		

PROGRAM / MEASURE	VALUE (MILLION EURO) Public support	Corporate invest.*	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
AnSem NV CoPlaSM - Multi-Standard Communication Platform for Smart Metering NXP Semiconductors Belgium NV	0,39	0,65	2013	- Based on the total government contribution and the project duration, the annual government contribution is estimated by dividing the total contribution by the project duration. - We only include projects which were still active in 2013. **Step 2. The corporate investment is estimated** - Based on the maximum support of the different project themes (R&D - 25%-50%, strategic basic-research 100% and S.M.E. program 35%) - We assume that each project had maximum project subsidy. This gives a rather conservative estimation of total national contribution.	Source: IWT annual activity reports.
PARKWIND NV	0,36	0,61	2013		
BUILDING ENERGY NV	0,14	0,26	2013		
BATTLE : BATTery modelling of Lithium chemistries based on an Eclectic approach	2,34	-	2013		
BIOLEUM : Fuels and Chemicals by fast pyrolysis of biomass	1,98	-	2013		
2.4.5 MIP3: Environmental and Energy Technology Innovation Platform					
MIP3 - total budget	1.90	-	2013	Total budget of 2012-2013 is assumed to be equally split over two years.	- Website i-Cleantech Vlaanderen
2.4.6 Smart Grid Flanders					
Smart Grid Flanders – total budget	10	30	2013	Yearly budget of Smart Grid Flanders is assumed	- Website Linear Smartgrid

* To avoid double counting with the corporate climate services (based on LCEGS data), the corporate contributionsare not included in the climate finance diagram and are only displayed here for illustrative purpose.

PROGRAM/ MEASURE	VALUE	YEAR	METHODS/ASSUMPTIONS/LIMITATIONS	REFERENCES
3. Corporate climate Services				
Consultancy	**55,38**	2013	**Step 1. The total sales of corporate climate services are calculated** - To avoid double counting, only the private contributions of the LCEGS database are taken into account and not the share of private contributions, which were calculated for the individual EU and national R&D project above. - Based on information of the LCEGS database, the total sales of the corporate climate services related to consultancy, carbon finance, adaptation & resilience and energy management are included. - The sales date of 2012 is multiplied with the average index of 2013 (1,1%) to estimate the sales in 2013 (BAU scenario) **Step 2. The total cost of corporate climate services are calculated** - Based on the total sales of 2013 (see above), the total cost of corporate climate services is calculated as 60% of the sales.	-LCEGS, 2012 -Inflation.EU – historical inflation Belgium 2013 (average year)
Energy Management	**345,22**	2013		
Carbon Finance	**185,10**	2013		
Adaptation & Resilience	**258,00**	2013		

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