



EeDaPP
Energy efficiency
Data Protocol
and Portal

D3.1. Technical report
Energy Efficiency Reporting
Criteria Market Mapping



Executive Summary

EeDaPP intends to deliver large-scale, granular technical and financial data related to energy efficient mortgages by way of a standardised data protocol to be accessed through a common, centralised portal. The present report provides a comprehensive mapping of reporting criteria for energy efficient mortgages. The objective is to display a comprehensive “check list” for energy performance and financial indicators to underpin the Energy Efficient Data Protocol and Portal, provided they comply with technical and feasibility constraints. This mapping is built on previous research conducted under the Energy efficient Mortgages Action Plan (EeMAP) or is drawn from existing practices and financing schemes from the private and the public sectors, and analysed from an origination and a funding perspective.

Energy efficiency criteria can be classified into three categories quantitative, normative and qualitative. First, quantitative criteria are continuous variables that provide empirical information on key energy performance elements (final energy consumption, building envelope performance, Carbon dioxide emission level) or refer to cost and value assessment (retrofit costs, green property value). Second, normative (target) criteria are performance criteria evaluated in comparison to a norm, a benchmark or baseline (Energy Savings target, 15% “Best in Class” performance indicator, Carbon savings target). Third, qualitative criteria are discrete, non-quantitative variables (readable or “box ticking” format) that indicate energy performance via audit or certification process (Energy Performance Certificates or Labels related to buildings, energy upgrades and/or SMEs). Energy efficiency measurements relate to either the final energy consumer (household or user in the case of commercial buildings), the property (building energy performance), the loan (or energy efficiency investment) or the bank’s portfolio (green bond certification criteria) and for some of them, their assessment requires the use of exogeneous variables relative to the energy sector (national energy mix and prices), the climate (altitude, climate zone) and the economic environment.

In a first effort to address the relevance and feasibility of energy efficiency measurement criteria for the Energy Efficient Data Protocol & Portal Initiative, a mapping for existing market practices was conducted. In energy efficiency and performance financing, in order to comply to their targets (specified in energy or carbon savings) four practical strategies stand out. First, the use of building codes national regulation that set up minimum standards per construction year or period is common to assess the energy performance of new buildings, especially commercial ones. Second, the use of labels and certificates is common, in particular the national version of European Energy Performance Certificates (EPCs) and building labels either of national or international scope (such as BREEAM, LEED, DGNB and HQE). Third, as spotted in private and public financing schemes for energy upgrades, energy renovation roadmaps (list of eligible energy improvements to the building or the heating system) can be used as an energy efficiency criterion, some schemes also used renovation labels (BBC Renovation or Effizienzhaus labels). Finally, quantile indicators, such as the 15% “Best in Class” indicator are often used as a compliance, robustness and stringency test for regional energy efficiency criteria in the “green bond” certification process.

As far as loan-level data used for the purposes of reporting is concerned, the European Central Bank’s Asset Backed Security Loan Level Initiative, the Bank of England’s Eligible Collateral Framework and the European Banking Authority’s Non-Performing Loans Transaction Templates provide the obvious starting point for the mapping of relevant variables. In practice, loan-level data can be classified into four mandatory categories: (1) loan data, (2) property/collateral data and (3) borrower data and (4) performance data. Optional categories typically reflect national or deal specificities or are requested for the specific needs of a rating agency.

The preliminary findings of the current mapping exercise will be explored in more detail in subsequent reports with a view to narrowing down the variables and defining the list to underpin the data protocol.

Table of Contents

Executive Summary	2
1. Introduction	4
1.1 Context.....	4
1.2 Objective	4
1.3 Outline.....	5
2. Energy Efficiency Criteria : description and stakes	6
2.1 Quantitative criteria	6
2.2 Qualitative criteria	8
2.3 Normative, target criteria	11
3. Energy Efficiency Criteria : Market initiatives	12
3.1 European level initiatives.....	13
3.2 Financing Energy Efficiency from the Retail Side	14
3.3 Financing Energy Efficiency from a funding perspective	20
4. Energy Efficiency Reporting Criteria: Takeaways	30
4.1 Energy Efficiency available criteria	30
4.2 Commonalities and control variables.....	32
4.3 Summary table and temporary assumptions.....	33
5. Financial Reporting Criteria.....	35
5.1 European Central Bank's (ECB) Asset Backed Security Loan Level Initiative.....	35
5.2 Bank of England (BoE) Eligible Collateral Templates.....	35
5.3 European Banking Authority (EBA) Non Performing Loan Transaction Templates.....	36
5.4 Commonalities	36
6. Conclusions and Next steps	38
7. Bibliography	39
8. Appendix	40

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1. Introduction

1.1 Context

While some progress has been made in green finance, only a fraction of bank lending and funding (securities) is explicitly classified as green¹. The lack of standardisation in terms of reporting definitions and dynamic data sets is a significant obstacle to the development of the market, and hinders transparency, viability and risk assessment.

EeDaPP intends to deliver large-scale, granular technical and financial data related to energy efficient mortgages by way of a standardised data protocol to be accessed through a common, centralised portal.

In this way, EeDaPP builds on and complements – and is crucial to the long-term success of – the ongoing EeMAP Project, which is intended to design an energy efficient mortgage financing mechanism, according to which building owners would be incentivised through favourable financing conditions to improve the energy performance of their buildings or acquire a property that is already energy efficient.

EeDaPP has long-term potential to scale-up the expected impacts of the EeMAP Project to encourage significant energy reductions. It will also boost the green securities market in terms of size, liquidity and efficiency by providing for the traceability of the performance of energy efficient assets, allowing for the identification of such assets for the purposes of energy efficient covered bond/bond issuance, and by significantly boosting investor confidence in such securities.

A key output of the EeDaPP initiative is the definition of specific reporting criteria for the gathering of data on energy efficient mortgages to underpin the data protocol. As a first step in this direction, this report proposes a mapping and a comprehensive analysis of the energy efficiency and financial reporting criteria already available and/or used by European market participants.

The [EeDaPP consortium](#) brings together all necessary competences (financial, data processing and management, property valuation, portfolio analysis, energy provision and data, architecture and infrastructure design) to develop a robust, workable and marketable pan-European data protocol and portal. Table 2 lists the EeDaPP consortium partners.

N°	Part. Organisation Name	Part. short name	Country
1	COVERED BOND & MORTGAGE COUNCIL	EMF-ECBC	Belgium
2	UNIVERSITÀ CA' FOSCARI VENEZIA	UNIVE	Italy
3	CRIF SPA	CRIF	Italy
4	EUROPEAN DATAWAREHOUSE GMBH	ED	Germany
5	HYPOPORT BV	HYPO	Netherlands
6	TXS GMBH	TXS	Germany
7	JOHANN WOLFGANG GOETHE UNIVERSITAET FRANKFURT AM MAIN	SAFE	Germany

Table 2 EeDaPP consortium partners

1.2 Objective

As indicated above, the main objective of this report is to map and analyse the energy efficiency and financial reporting criteria needed, and those that are already available and used by European market participants, with a view to defining a reliable set of reporting criteria on energy efficient mortgages to underpin the data protocol.

¹ The generic term “green” is here used to qualify assets that integrate sustainable and climate change mitigating features such as the improvement of energy efficiency

The process of designing a workable and marketable protocol, which in turn underpins a common data portal, requires a comprehensive understanding of data collection standards and a comprehensive mapping of granular 'green' data reporting criteria. A pan-European protocol for the gathering of energy efficiency data will allow for the processing and tracking of features and performance of energy efficient assets across Europe in a harmonised way. The criteria will allow for a linking between the property and its green features, and characteristics and performance of the loan and the borrower.

When defining the common energy efficiency reporting criteria specifically, the Project will build on pan-European common Energy Performance Indicators identified by the EeMAP project. These energy efficiency reporting criteria will be complemented by well-known financial reporting criteria. Once the reporting criteria are defined, data providers will be invited to respect them in order to be able to make use of the protocol and a future, common data portal.

Within this objective, the intention is to perform:

- Research and summarise existing 'green' reporting criteria to create an overview of the current reporting standards in place for 'green' assets;
- Research and summarise existing financial reporting criteria to create an overview of the current reporting standards in place for financial assets;

The delivery of this research will allow, in a second stage, for the following objectives to be met:

- Analysis of the existing reporting standards to understand market needs and gaps;
- Identification of a standardised framework for energy efficiency data gathering, processing and disclosing

1.3 Outline

To conduct a comprehensive mapping of energy reporting criteria, this report draws on the existing market practices and on the recommendations of Energy efficient Mortgages Action Plan (EeMAP).

The second section makes a first description and analysis of energy efficiency indicators, how they are measured, and how they can be used. The third section of the report provides an analysis of existing initiatives for energy efficiency financing in the housing sector from both retail and funding perspectives. The fourth section synthesises the key takeaways of the two previous sections to elaborate a putative energy efficiency checklist and data reporting needs. The fifth section is drawing the list of existing financial data reporting needs and requirements. The final section concludes and elaborates first recommendations and next steps to be taken.

2. Energy Efficiency Criteria : description and stakes

Measuring energy efficiency and performance in the building sector is a multi-level exercise. Buildings consume energy in two forms, electricity and heat. These two “secondary” energy products come from several primary energy sources: fossil fuels (oil, gas, and coal), firewood, nuclear energy (carbon neutral) and renewables (biomass, wind, solar and hydro). Building users (households and businesses) consume final energy in the form of energy services: heating and cooling, cooking, hot water and specific use (electrical appliances). Energy efficiency gains mean that for the same energy service, one consumes less final energy compared to either a time baseline, or an equivalent counterpart (benchmark). Those gains come either from a higher building performance (and ability to keep a place at the optimal temperature) or better equipments. Energy Efficiency indicators can be classified into three categories: quantitative, normative and qualitative:

2.1 Quantitative criteria

Energy consumption:

Final energy consumption is measured in kWh/m²/year that is kilowatt per hour consumed within a year per habitable m². From a building unit perspective, final energy consumption can range from zero (for zero net energy buildings) to more than 400 kWh/m²/year for the least efficient buildings. From a usage perspective, the

What is the Energy Performance Gap?

The “energy performance gap” conceptualises the set of discrepancies between real energy consumption (obtained from energy distribution companies) and calculated energy consumption (based on both the building characteristics and modelled heating and cooling behaviour of occupants). This concept has been investigated by researchers for a long time because it can be a source of mistakes and wrongdoings at the policy level as the gap can reach 30% on average in Europe (see Sorrell, 2009). Many researchers claim that the difference is largely encumbered by occupant behaviour (conservativeness and comfort levels). Investigating the influence of occupant behaviour on energy demand reveals also important insights. The effect of sociodemographic variables such as income, age or household type on energy demand are sizable but complex as they give an idea on the comfort level of the occupant but also the potential “rebound effect” one can expect when improving the energy efficiency of a dwelling. Such rebound effect in the energy final consumption can be an explanation for the under-estimation of high energy-efficient dwellings. Relying on actual energy consumption data put the outcome at risk to have owner/tenant split incentive as several researches show that the rebound effect for tenants is significantly larger than for landlords (see Madlener et al., 2011).

Other explanations for this gap are construction mistakes, improper equipment adjustment and usage and simplistic simulation models. Those are also factors to take into account when measuring and reporting on energy efficiency.

three drivers of final energy consumption are: heating and cooling (space and water) (80%), cooking (5%) and specific electricity consumption (electrical appliances) (15%) (Eurostat²). Energy consumption can be empirical (measuring real energy consumption using a smart metering system for example) or calculated, i.e. modelled using elements from the building performance (construction year and type, thermal properties, equipment and environment) and usage factors (household characteristics such as income, occupancy rate, size...).

Building Envelope and heat transfer coefficient (U-value or H-value):

A building envelope is the physical separator between the conditioned and unconditioned environment of a building

²http://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_consumption_in_households#Energy_consumption_in_households_by_type_of_end-use

including the resistance to air, water, heat, light, and noise transfer, and comprises four components: walls, windows, roof and floor. The building's performance can be assessed by the thermal properties of each of those components. Thermal transmittance, also known as U-value or H-value depending on the country, is the rate of transfer of heat through a structure (which can be a single material or a composite), divided by the difference in temperature across that structure. The units of measurement are $W/m^2 \cdot K$. The better-insulated a structure is, the lower the U-value will be. For example, old houses built before 1975 and not retrofitted have a mean U-value of about $2.5 W/m^2 \cdot K$ and a final energy consumption for space heating of over $200 kWh/m^2/year$ whereas recent houses (built after 2012) have a mean U-value of $0.6 W/m^2 \cdot K$ and consume less than $80 kWh/m^2/year$ ³. Workmanship and installation standards can strongly affect the building's thermal transmittance. If insulation is fitted poorly, with gaps and cold bridges, then the thermal transmittance can be considerably higher than desired and the energy performance of the building will be poor.

Thermal coefficient (or U-values) can be used as KPI for the quality of energy retrofit undertaken for each of the four envelope components. Though calculations require a high level of technicality and equipment and require the intervention of an energy auditor (thermopile sensor that is firmly fixed to the test area, to monitor the heat flow from inside to outside during a minimum period of two weeks).

REVALUE Project:

REVALUE is an EU-funded Project to develop international guidance for property valuers, incorporating the collection and easy analysis of relevant evidence. This is intended to help valuers to reflect the value of energy efficiency (EE) in their valuations of social and private housing stock.

It is hoped that by introducing guidance to practitioners in the market, additional income streams could be recognised, and other value drivers found. Investors and financiers may begin to reflect EE in their risk assessments and cash flow projections; potentially unlocking additional streams of finance or resulting in adjusted discount factors.

Energy Bills:

Energy bills state on a monthly, quarterly or annually basis, the user's energy expenditures which represent the volume of energy consumed (in kWh) at the price of the primary energy used (electricity, gas, fuel, coal, firewood) depending on the equipment fuel type. The amount of energy expenditures in the EU depends on three major factors: energy retail prices (or levelised cost including production, transport and distribution costs), taxes and the energy performance of both the building and its equipment. Housing costs (rental or mortgage interest payments and water, electricity, gas or heating expenditures) represent a fair share (25%) in the average EU disposable income with strong disparity among Member States and income deciles.

The Innovate UK-funded LENDERS project has found that the monthly savings from fuel bills in a higher rated home (equivalent to two EPC bands), could equate to around £4,000 in additional mortgage finance. These findings stress the benefits of owning an energy efficient property by highlighting the potential savings homebuyers could archive on their fuel bills and the impact which an increase in disposal income could have on their borrowing capacity by incorporating energy performance linked fuel costs as a factor in the mortgage affordability calculations.

Carbon footprint: Kg of CO₂ equivalent emitted (or saved) per unit observed:

Carbon dioxide (CO₂), emitted through anthropic activities, is the main greenhouse gas responsible for global warming. The Intergovernmental Panel on Climate Change (IPCC) uses it as a core unit of measure to model global warming levels, scenarios and trends. The scope of the criteria determines the perimeter of the observed unit. Scope 1 limits the measure to the direct emission of the unit, scope 2 integrates the CO₂ emission necessary

³ See <https://www.chaireconomieduclimat.org/en/publications-en/research/wp-2016-03-energy-efficiency-in-french-homes-how-much-does-it-cost/>

to the Unit construction and achievement, scope 3 broadens the measure over the full life-cycle of the unit observed.

Carbon emissions are a quantitative indicator widely used to measure the impact of energy and climate mitigation strategies at national and supranational levels. The Climate Bond Initiative provides a Carbon target calculator for low carbon buildings comprised in the pool of assets for residential and commercial buildings and property upgrades⁴.

Green property value:

Market Value (MV) is the estimated amount for which an asset or liability should exchange on the valuation date between a willing buyer and a willing seller in an arm's length transaction, after proper marketing and where the parties had each acted knowledgeably, prudently and without compulsion. (International Valuation Standard 104 - paragraph 30.1).

Green property value corresponds to the additional market value generated by a good energy performance, all other things deemed equal. This form of "good will" can be seen as the return on investment of energy efficiency upgrades. For the "energy efficiency" market value to be achieved, the property must be valued according to the current market's ability to achieve a "fair price". It can be seen in two ways: either a property with good energy performance is sold at a higher price on a comparable market or it is sold faster than other comparable properties (reduced vacancy rate). Hence, green property value can be expressed in monetary terms (absolute additional value), or in percentage (relative additional value with respect to the pre-refurbishment asset or a comparable less energy performant benchmark).

2.2 Qualitative criteria

Qualitative criteria are discrete, non-quantitative variables that display energy performance evaluation in a readable or "box ticking" format.

Energy Performance Certificates (EPC):

EPCs were introduced through the first Energy Performance of Buildings Directive (hereafter EPBD) in 2002 (Directive 2002/91/EC), which required that a certificate be produced for buildings at the point of construction, sale or rental. Requirements for national EPC systems were strengthened by the recast EPBD in 2010 (Directive 2010/31/EU), which introduced, among other things, additional quality assurance checks. By 2013, all EU Member States had implemented an EPC system⁵.

EPCs provide information for consumers on buildings they plan to purchase or rent with a normalised ascending categorical kWh/m²/year grade. Since 2010, certificates must be included in all advertisements in commercial media when a building is put up for sale or rent. They must also be shown to prospective tenants or buyers when a building is being constructed, sold, or rented. After a deal has been concluded, they are handed over to the buyer or new tenant. EU countries must also put in place schemes for the inspection of heating and air-conditioning systems, or take measures that have an equivalent impact on energy savings.

As indicated in the EeMAP Report on 'A Review of the State of Play on 'Green' Performance Indicators'⁶, the Energy Performance of Buildings Directive allows that EPCs be produced by using either theoretical calculation

⁴ <https://www.climatebonds.net/standard/buildings/residential/calculator>
<https://www.climatebonds.net/standard/buildings/commercial/calculator>
<https://www.climatebonds.net/standard/buildings/residential/calculator/illustration>

⁵ See EeMAP technical report on building performance indicators available here: <http://eemap.energyefficientmortgages.eu/wp-content/uploads/2018/04/EeMAP-Technical-Report-on-Building-Performance-Indicators-that-Impact-Mortgage-Credit-Risk.pdf>

⁶ Report on "A Review of the State of Play on 'Green' Performance Indicators" prepared by the European Regional Network of the World Green Buildings Council for the Energy Efficient Mortgages Action Plan (EeMAP)

or measurement. The first is known as an **asset rating** and is based on standard assumptions about the use of the building.

An asset rating does not reflect the behaviour of the occupant and typically only includes energy consumption considered to be directly related to the building:

- space and water heating,
- cooling
- lighting
- ventilation
- other building related energy use e.g. pumps

The approach based on measurement is known as an **operational rating** and reflects the actual use of the building by the occupant. An operational rating includes all energy consumption, for example for cooking equipment and other domestic and electronic appliances.

Across the EU, the asset rating is the most commonly used for residential buildings and where Member State EPC systems include provision for use of operational rating these are generally restricted to certain types or ages of building (see adjacent case studies). The EeMAP Report concludes

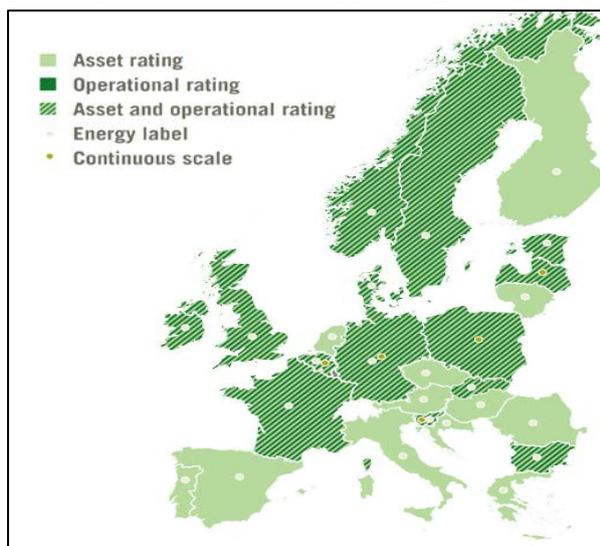


Figure 1 EPC methods used across Europe (BPIE)

and practical first step as a common energy efficiency criterion for a pan-European energy efficient mortgage market. There are, however, two caveats to their use. First, EPCs lack full coverage of the European building

CASE STUDY: OPERATIONAL RATING EPCS

Several countries use some form of operational rating in their EPC systems. In Sweden, for new buildings, the asset rating is calculated during design to ensure compliance with energy efficiency standards. After completion, compliance is verified during the second year of operation using an operational rating approach.

[Read more](#)

In France and Germany, the operational rating is allowed for residential buildings of a certain age, whilst in the UK, it is only applied to public buildings over a 500m².

In the UK, industry bodies such as UK-GBC have lobbied intensively for the extension of the existing operational rating EPCs, which are known as Display Energy Certificates (DECs), due to their success in reducing public sector energy use.

that, for mortgage credit risk assessments, the operational rating could be more suited for the purpose of assessing probability of default, because it reflects actual energy use and therefore occupant expenditure. The asset rating may be more useful for assessing loan-to-value and loss given default, since it reflects the characteristics of the property and is independent of the occupants' behaviour. However, this depends on the reliability of the calculations and the data inputs.

Analysis by BPIE shows which approaches are used in each Member State (see Figure 1) and highlights that some Member States allow both approaches to be used in different cases ⁷.

EeMAP research and recommendations indicate that EPCs stemming from European legislation are a useful

⁷ BPIE, 'Energy Performance Certificates Across the EU - A Mapping of National Approaches'.

stock, although coverage is broadening over time. Second, EPC calculation methods differ from country to country. This nuance has important consequences in terms of performance monitoring and data sourcing.

BEST PRACTICE EXAMPLE: EPC+ FLANDERS

In 2014, the Flemish Government launched its “Renovation Pact” (2014-2018), which is coordinated by the Flemish Energy Agency (VEA) in cooperation with a wide range of stakeholders, including regional and local governments and representatives from the housing and building sectors. The Renovation Pact is intended to achieve an improvement of the energy performance of the region’s building stock so that by 2050 the existing building stock should be as energy-efficient as the current requirements for new buildings.

A key action foreseen in the Renovation Pact from January 2019 is the introduction of an EPC+, which is intended as a more user-friendly version of the current EPC. The key difference will be the inclusion of an energy label, in addition to an energy score. The EPC+ will also include recommendations for improvements to be made in order to achieve better energy performance in the property, as well as cost indications.

Building codes and labels:

Energy efficiency of buildings can be assessed by regulation enforcement based on the construction year or a certification process (label obtained based on energy performance assessment).

Building regulations set minimum quality requirements to ensure that buildings are safe, healthy and energy-efficient. A building regulatory system is present in every investigated EU Member State and enables the assignment of a specific construction period, derived energy consumption and performance standards with which the building had to comply. The subjects covered by the building regulations are identical in EU Member States and established by the European Performance of Buildings Directive (EPBD). However, there are many differences between countries regarding who sets the building regulations, how the technical building regulations are organised and formulated, what the role is of national standards and how building regulations apply to existing buildings.

Therefore, building energy performance derived from building codes or national labels is usually restricted to their national markets (like Miljöbyggnad in Sweden, GBC Home in Italy or HomePerformanceIndex- HPI in Ireland), although there are some certification and building labels that are present and used in other countries⁸:

- BREEAM: BRE Environmental Assessment Method from the UK
- DGNB: German Sustainable Building Association label
- HQE: High Environmental Quality label from France
- LEED: Leadership in Energy and Environmental Design label from the USA
- Verde label from Spain
- The Passivhaus standard from Germany

Renovation roadmaps:

This is a list of eligible energy retrofits that concur to a minimum energy efficiency targeted level. It is based on the fact that specific energy retrofits and renovation schemes can achieve a significant decrease in the unit’s final energy consumption by: increasing the building’s energy performance; implementing measures that achieve better insulation and airtightness, reaching a better building envelope that therefore requiring less

⁸ For more details, please see the EeMAP technical report on Building Performance Indicators

energy for the same thermal comfort; or by improving or replacing the heating and cooling equipment (with performant and/or equipment relying on renewable energy).

For example, measures that could be implemented in order to reach the KfW Effizienzhaus-55 standard includes:

- Wood pellet, biomass heating or heat pump
- Solar heating system for hot water
- Exterior wall insulation
- Roof insulation
- Windows with triple glazing and special frame

SME labels and/or certification schemes:

Certification processes and labels can evaluate and signal that the renovations conducted by certain SMEs (and equipment installed) achieve minimum energy performance. At the national level, some labels are used to determine eligible costs for public grants and subsidies like the RGE label in France (*Reconnu Garant de l'Environnement*). In this context, the SEAF project funded under the Horizon 2020 programme developed an online platform for insurance schemes and certifications delivered to SME's (See more here: <https://www.eu.jouleassets.com/>).

iBROAD Project

The EU-funded iBROAD (Individual Building Roadmap) project, which seeks to develop and pilot a European model for building renovation passports, is running in parallel to EeMAP. The iBROAD project anticipates a tool that looks at the building as a whole and provides a customised renovation plan with a long-term horizon (15–20 years). The renovation roadmap will be combined with a repository of building-related information (building logbook/passport) on aspects like the energy consumption and production, executed maintenance and building plans. Building performance passports and renovations roadmaps are being trialled at national level in several locations in Europe, such as the Individueller Sanierungsfahrplan (Individual Renovation roadmap) in Germany, the Woningpas (Dwelling ID) in Flanders, Belgium, the Energy Efficiency Passport (Passeport Efficacité Énergétique or P2E) in France.

Read more here: <https://ibroad-project.eu/>

2.3 Normative, target criteria

Energy Savings:

This variable (in either kilowatt or in percent if compared to a baseline) indicates the minimum variation in energy efficiency that must be achieved by energy upgrades compared to the initial situation observed. This can be indexed to the building's sole performance (U-value or final energy consumption expressed in kWh/m²/year or with the integration of efficient or fuelled by renewable energy heating and cooling equipment) or be indexed to the dwelling's usage and real energy consumption (kWh measured empirically). (See the focus on the energy efficiency gap to know more about the differences between calculated and real energy consumption savings).

"Best in class" quantile indicator:

A comparative indicator can be built according to the energy performance level of building stock for a relevant baseline or benchmark. According to this normative indicator, the assets that can qualify as energy efficient must be "best in class" i.e. located in the top quintile of the relevant market distribution.

For example, The Climate Bond Initiative (hereafter CBI) establishes standards regarding buildings and residential mortgages in its certification process for the Green Bond market (long term financing debt issuance used to finance green assets in the real estate sector). To assess the robustness and relative stringency of local energy efficiency criteria used by Green Bond issuers, CBI is using a 15% "best in class" eligibility criteria. Regional building codes, energy labels or rating tools are compared to their relevant market by either using a Carbon performance benchmark or by modelling the market's energy performance distribution⁹. EE criteria are deemed

⁹ See CBI standards for the real-estate sector here: <https://www.climatebonds.net/standard/buildings>

eligible if the asset they select lie in the top 15th percentile in terms of carbon performance or energy efficiency among the entire relevant market.

Using this approach, CBI has approved as proxies of Low Carbon Buildings and Green Bond certification, regional EE criteria for several countries and states such as California, New Zealand, England and Wales and France.

3. Energy Efficiency Criteria : Market initiatives

KEY FINDINGS: This section provides an overview of existing market initiatives, i.e. energy performance and efficiency financing schemes in the building sector, for new or existing, commercial or real estate properties. We took relevant information on the different energy efficiency criteria used from the origination and retail perspective but also from a funding perspective by looking at Green Bond certification and “impact reporting” criteria.

This report concludes that the energy efficiency checklist relies mostly on supranational level indicators such as EPC grades and building certifications (BREEAM, LEED, DNBG, HQE), and practical indicators such as building construction periods and building type (accounting for building codes and regulation). In some countries such as the Netherlands, banks also use real estate data provider to provide the estimated energy consumption for each building in the portfolio.

We can observe from the retail financing perspective that the few EEM products that operate on the retrofit market rely on a list of eligible costs and retrofit roadmap (especially in France and Germany) or EPC “notches” that can be both translated into substantial energy efficiency gains (between 25% and 50%). We also see that cost efficiency and profitability (net present value) for energy upgrades are taken into account in several schemes.

On the funding side, “green bond” frameworks rely systematically on third party certifications and comply to the Climate Bond Initiative’s standards for the real estate sector. To this end they employ a “best in class” approach to assess the robustness and stringency of the national energy efficiency criteria used. In order to present “impact reporting” for investors, Second Party Opinion usually translates energy savings into CO₂ equivalent emission (generally using the carbon footprint of the primary energy mix and of the building heating type) to align the “Green bond” portfolio to supranational climate related goals such as the Green Bond Principles (or GBP) developed by ICMA.

To provide a comprehensive and relevant mapping of the Energy Efficient financing market, this report focuses on existing initiatives that include energy performance and efficiency factors to finance the housing sector. In this respect the report analyses the initiatives from three perspectives: retail, institutional and funding.

On the retail side, private initiatives in Europe and the US are described as well as public financing schemes at the regional, national and European level.

On the funding side, European issuers have gained a fair level of expertise in the issuance of green bonds to finance their activities in the “green” real estate sector. The following section focuses on green bond issuances that relate to the building sector, either commercial or residential and take the form of senior unsecured debt, senior secured, and covered bonds. It is non-exhaustive but describes the proceeds of selected issuers and good practices that represent a fair and relevant overview of the market in our view¹⁰.

¹⁰ A list of all the issuances certified as “green bonds” by the Climate Bond Initiative can be found on the CBI webpage (<https://www.climatebonds.net/standards/certification>) and are displayed in the Annex 8.2 of this report.

3.1 European level initiatives

There are several financing schemes at the European level, that aim to improve energy efficiency in the European building sector.

3.1.1 Private Finance for Energy Efficiency (PF4EE):

The Private Finance for Energy Efficiency (PF4EE) instrument is a joint agreement between the European Investment Bank (EIB) and the European Commission which aims to address the limited access to adequate and affordable commercial financing for energy efficiency investments. The instrument targets projects which support the implementation of National Energy Efficiency Action Plans or other energy efficiency programmes of EU Member States. The PF4EE instrument will provide a portfolio-based credit risk protection provided by means of cash-collateral (Risk Sharing Facility), together with long-term financing from the EIB (EIB Loan for Energy Efficiency) and expert support services for the Financial Intermediaries (Expert Support Facility).

Regarding energy efficiency financing in the building sector, the EIB has set up a list of eligibility criteria described in the Annex 4 of the Request for Proposals document¹¹ :

On a general note, eligible energy efficiency projects should be justified based on an economic cost-benefit-analysis, for which in general the net present value of the energy saved including externalities, is greater than the net present cost of the project over its life. Where it is difficult to separate out the investments directly related to energy savings, it is necessary to demonstrate that energy efficiency is a significant element of the project. In these cases, the energy savings, including environmental externalities, should at least cover 50% of the project cost in an economic analysis.

For the following categories of investments additional specific criteria apply. For Energy Savings and Energy Efficiency in Buildings financing: Major renovation of existing buildings as defined in Directive 2010/31/EU (EPBD): Investments shall achieve at minimum the cost-optimum refurbishment level as reported by the Participating Country. Building renovation not subject to the application of the EPBD: For measures relating to the building envelope, application of minimum requirements (U-values) identified in the definition of cost optimum levels (according to EPBD) Energy related building technologies (i.e. HVAC, control and regulation systems, lighting) must demonstrate economic profitability.

3.1.2 European Local Energy Assistance (ELENA):

ELENA is a joint initiative by the EIB and the European Commission under the Horizon 2020 programme. ELENA provides grants for technical assistance focused on the implementation of energy efficiency, distributed renewable energy and urban transport projects and programmes. The grant can be used to finance costs related to feasibility and market studies, programme structuring, business plans, energy audits and financial structuring, as well as to the preparation of tendering procedures, contractual arrangements and project implementation units.

3.1.3 Smart Finance for Smart Buildings Initiative (SFSB):

The Commission has launched the Smart Finance for Smart Buildings (SFSB) initiative, as part of the 'Clean Energy for All Europeans' package¹². Building on the Investment Plan for Europe, it includes practical solutions to mobilise private financing for energy efficiency and renewable energies in buildings. As part of the SFSB initiative, the Commission is developing with the EIB a flexible model of guarantee facility to be deployed primarily at national level. This instrument aims to encourage the combination of different public financing strands, with a special attention being given to the EFSI and ESIF, to get the best possible results. It will allow financial

¹¹ http://www.eib.org/attachments/documents/pf4ee_request_for_proposals_en.pdf

¹² https://ec.europa.eu/energy/sites/ener/files/documents/1_en_annexe_autre_acte_part1_v9.pdf

intermediaries such as commercial banks to develop and deploy attractive financial products for the energy renovation of buildings, home renovations in particular. The SFSB initiative also supports the use of Energy Performance Contracts in the public sector. These are a practical way of making public buildings and other public infrastructures more energy efficient: the initial investment is covered by a private partner and repaid by guaranteed energy savings.

3.2 Financing Energy Efficiency from the Retail Side

Financing energy efficiency in Europe has long been the prerogative of public financing schemes and specialised institutions, which have developed energy efficiency criteria and standards that are helpful to the private sector. This section therefore assesses financing schemes using both public and private financing tools. Several countries are analysed : Germany, The Netherlands, Belgium, France, Germany, Ireland and Sweden.

3.2.1 KfW promotional programme for energy efficiency in buildings

Kreditanstalt für Wiederaufbau (hereafter KfW), or 'Credit Institute for Reconstruction', is a German financial institute that administers public funds in the form of grants, subsidies and loans to support construction and energy-efficient new buildings and renovations. The large majority (more than 75%) of discounted loans for energy efficiency measures in Germany are granted by the KfW¹³.

The KfW energy efficiency programme finances residential properties to achieve energy performance as defined by national building regulations set by the German Energy Savings Ordinance (or EnEV). KfW incentivises investment that sets energy efficiency targets beyond the legislative framework with degressive borrowing costs. The level of support is determined by reference to EnEV standards and KfW energy efficiency criteria that take the form of a self-designed label or "brand": "Effizienzhaus". The Effizienzhaus scheme measures and scores the energy performance of each building according to current EnEV standards. For new builds, support is available if the property meets either the KfW Effizienzhaus 55 or Effizienzhaus 40 standards. For existing properties, renovation loans can improve performance to one of five standards, Effizienzhaus 115, 100, 85, 70 or 55. An Effizienzhaus-70 property uses only 70 per cent of the primary energy of a new house built to meet the current EnEV standards, while an Effizienzhaus 115 uses 15 per cent more energy.

For a whole-house refurbishment, the Effizienzhaus label uses a holistic approach and integrates several elements to assess the energy performance of a dwelling:

- national EPC valuation standards
- list of eligible energy retrofit with minimum performance standards (wall, roof, floor, windows)
- renewable energy contribution: using the principle of free technology choice for the borrower who can choose the way to reach the standards by improving the building envelope with the use of renewable energies

¹³KfW is the world's largest national development bank and in terms of total assets the third largest bank in Germany. Development banks are special banks that pass on public funds through special loan programs. KfW's capital is held four-fifths by the Federal Republic of Germany and one-fifth by its federal states.

German Energy Saving Ordinance or EnEv

In the case of an energy-efficient renovation of buildings, the Energieeinsparverordnung 2014 (Energy Saving Ordinance or EnEV) must be fulfilled. The EnEV in combination with the Energieeinsparungsgesetz (Energy Saving Act or EnEG) contains the construction and system engineering requirements, which must be fulfilled during the renovation or extension of existing residential buildings. The EnEV demands energy-efficient buildings: It limits both the primary energy demand for heating, water heating, ventilation (and lighting in non-residential buildings) and the heat loss through the building envelope. In addition, energy certificates for new constructions and existing buildings are required.

When modernising or renovating an existing building, EnEV 2014 set out minimal heat transfer coefficient (U-values) for 12 relevant building components (walls, floors, roof, windows and doors). In addition, some compulsory retrofits must be made in the building stock, regardless of a planned project and provided their economic efficiency, such as central heating control, thermostats, boilers, ceiling and roof insulations.

Since 2007, the Energy Saving Ordinance (EnEV) requires issuance of energy certificates for existing buildings if they are to be let or sold. For new constructions as well as for renovations or extensions, during which an energetic balance for the entire building is calculated, energy certificates must be issued on the basis of the calculated energy demand. For the residential building stock, energy certificates can be prepared based, both on the calculated energy demand (known as an asset rating) and on the measured energy consumption (known as an operational rating).

3.2.2 Energy Efficiency financing schemes in the Netherlands

Energy Efficient loans and mortgages have been available in the Netherlands, since the 1990s. The main banks offer green mortgages for both new and existing homes. According to an approval by the Ministry of Housing, homeowners are allowed to borrow a 27,000 Euro higher mortgage for net-zero houses and 9,000 euro for houses with a low EPC or A++ label¹⁴.

- i. ABN AMRO: 0.2% discount on the interest rate for new homes, or existing homes with an A+ label or better.
- ii. Rabobank: 0.5% discount for 10 years for new homes that perform 50% better than national standards.
- iii. Triodos: interest rate based on the energy label; see the table below, offering a maximum discount of 0.6%. Additionally, a discount of 0.2% can be offered for the best performing homes (low in the A label class).

Green loans are also available for commercial buildings, and some banks offer services around the green loans. ING Real Estate Finance offers a 5-step loan approach with i) a free quick scan/self-assessment with an app; ii) a free energy consultation when the energy cost savings as predicted by the app are larger than 15,000 euro per year; iii) 100% financing of the sustainability measures; iv) 0.5% discount on the interest rate and v) a free Energy Label, when this label is C or better. Rabobank offers the Impact Loan, developed with the EIB using the BREEAM¹⁵ scheme (3 star or above) to determine the eligibility of buildings.

¹⁴ For more details see the EeMAP Building Assessment Briefing on The Netherlands, available here:

http://eemap.energyefficientmortgages.eu/wp-content/uploads/2018/04/EeMAP_Building_Assessment_Briefing_NETHERLANDS.pdf

¹⁵ BREEAM: British Certification System; Adapted to the Netherlands regulations (BREEAM NL) used in the Netherlands since 2013; Used for new, refurbished and extension of existing buildings.

All banks use the same app to make clients aware of their energy savings potential, developed by a Dutch Green Buildings Council member, in their own look-and-feel. The banks send a link to the building of the owner and financed by the bank. The basic data is prefilled, based on open data sources (function, size, age). The clients are asked to answer some simple questions on their building and the app generates energy efficiency measures including the investment cost and payback time. In the case of ABN AMRO, clients are also able to choose a supplier for the implementation of the measures that come out of the scan and ask for a site visit and final offer.

Triodos Mortgage

In 2013, TRIODOS bank, operating in several EU member states (Belgium, Spain, Germany and France), launched a product in the market called the TRIODOS Mortgage that links the interest rate with the energy certification and the environmental impact of future homes. The product finances the improvement of the energy performance of the property, with a reduction in the interest rate of the mortgage if the energy upgrades improve the certification. In addition to the energy certificate used as a validation criteria, Triodos Mortgage includes more qualitative and intangible criteria: health and comfort as well as social and environmental features: TRIODOS mortgage aims to help reduce fuel poverty by targeting households with disproportionate energy costs and an inability to deal with them.

The energy efficiency eligibility criteria are:

- For new Construction: Building construction code achieving E(w) 3 levels (30-50-60) and certified by PEB
- For renovation and energy upgrades: Energy Consumption normalised (Kwh/m²/annum) certified by PEB and by a building renovation roadmap regarding heating, energy producing, water saving equipment, usage of renewable energies

EPC certification in the Netherlands

EPC certification and data are provided and stored by the Netherlands Enterprise Agency "Rijksdienst voor Ondernemend Nederland" (RVO). There are two types of EPC: provisional and definitive. Every house in the Netherlands has received a provisional EPC based on property characteristics such as construction year and property type. Home owners are required to register a definitive EPC before the relevant property is sold or can register it on their own initiative. A definitive EPC has been audited by an expert; the expert does not visit the property in all cases but verifies the evidence provided by the home owner (such as pictures or invoices). Using definitive EPCs increases the certainty of selecting mortgages that have actually been improved by a minimum of 30%.

3.2.3 Energy Efficiency financing schemes in France

Energy Efficiency financing in France relies on several tools that still mostly come from the public sector.

- Fiscal tools (CITE, low VAT): List of eligible energy improvements + Accreditation of the building sector professional (RGE qualification)
- Subsidies at National level: Grants, benefits and public energy retrofit program from the French agency for housing upgrade or ANAH. Eligibility depends on homeowners' revenues and energy expenditures (programs target most vulnerable households in terms of income and energy price exposure)
- State-supported or subsidised green loans; eligibility depends on an eligible list of energy retrofits
- White certification scheme: List of eligible actions
- Regional or individual bank subsidies and preferential loans: List of eligible energy improvements (or) Labels and certification schemes (or) Global energy performance threshold

Subsidised green loan scheme (Eco-PTZ)

The government proposes subsidies for soft loans to finance energy efficiency upgrades (Eco-PTZ). These 0% Eco-loans are distributed by private banks to the private sector (households and collective landlords) and different local authorities have developed soft loans using public private partnerships. These loans allow its beneficiaries to finance their energy retrofits for an amount up to EUR 30,000. Eligibility depends on sustainability characteristics that are either based on a list of energy renovations (certification is granted upon presentation of invoices and costs form) or energy savings targets based on the building calculated energy consumption (certification is granted upon an Energy Audit form)¹⁶.

Eligible works should include at least two of the six measures described :

- Thermal insulation of the roof
- Thermal insulation of at least 50% of the exterior wall surface
- Thermal insulation of at least 50% of the exterior windows and doors
- Installation or replacement of a central heating and/or hot water systems
- Installation of a heating system fueled by renewable energy
- Installation of a hot water system fueled by renewable energy

The quantitative performance standards (in U-values, CO₂ emissions and Kw) are set and detailed in a synthesis table publicly available¹⁷. In addition, the works need to be done by a certified professional (the certification that applies is called RGE – at the end of 2016 there were 70,000 RGE professionals in France).

Eligibility can also be granted according to a more global energy performance target setting: for buildings built after 1950, a renovation roadmap is deemed eligible if they permit the attainment of a target minimum consumption threshold between 80 kWh/m²/year and 150 kWh/m²/year depending on the initial consumption, equivalent to a 30% increase in energy performance. In that case, renovation roadmap and thresholds are set by energy efficiency experts after an energy audit; EPCs are not deemed sufficient because they are not deemed accurate enough.

In 2017, more than 24000 éco-PTZ have been granted for a total amount of EUR 437mn (for an average amount of EUR 17,000 per loan). Among those loans, more than 50% financed 2 energy retrofit actions, 36% financed 3 retrofit actions and only 1% followed the global performance approach relying on an Energy Audit (SGFGAS¹⁸).

Energy Efficiency Financing in the social housing sector – Caisse des Dépôts Eco-loans

Caisse des Dépôts created the social housing eco-loan in 2009 in order to mobilise the Savings Funds in favour of the thermal renovation of social housing units in France. The eligibility criteria take the form of a renovation roadmap certified by agreement between Caisse des Dépôts and French Housing Ministry: a certain number of measures in favour of the thermal renovation of buildings for individual housing units. Credit conditions are indexed to the regulated, subsidised and dedicated savings accounts (Livret A and Livret Development Durable). In 2015 and onwards, the Livret A savings rate was at 0.75% and so, eco-loans with a maturity of 5–15 years have an interest rate of 0%.

The energy efficiency checklist grounding the financing scheme is established according to two possibilities based on a regulatory energy audit¹⁹ that established the building's initial energy consumption in kWh/m²/year.

- i. On a global energy performance assessment: the borrower must comply to a minimum energy consumption saving of 80kWh/m²/year controlling for the climate zone and the building's altitude. The

¹⁶ Links to the certification forms are available in the annex (in French)

¹⁷ <https://www.ecologique-solidaire.gouv.fr/sites/default/files/Cat%C3%A9gorie%20de%20travaux%20%C3%A9ligibles%20%C3%A0%20l%27%C3%A9co-ptz%20-%20Mars%202016.pdf>

¹⁸ Data related to the EcoPTZ are gathered from the different private banks to one institution, SGFGAS (*Société de Gestion des Financements et de la Garantie de l'Accession Sociale à la propriété*) that records volume, breakdown and costs data to perform trimestral statistics and eligibility analysis. <https://www2.sfgas.fr/web/site-public>

¹⁹ A particular Thermal Audit using regulatory TH-C-E (ex) methodology must be conducted for all new and existing buildings.

loan amount per unit is determined according to the amount of energy saved (from EUR 9,000 for 80-9kWh to EUR 16,000 for more than 270 kWh savings). A EUR 2,000 bonus is added per dwelling to the loan amount if the process results in the attribution of construction labels: HPE (High Energy Performance) and BBC Renovation (Low-Consumption Buildings after Renovation).

- ii. On energy renovation roadmap: the borrower must proceed to a list of renovation concerning insulation, ventilation, heating equipment based on the building envelope upgrade and the net renewable contribution (for heating equipment). The loan amount is here determined via a scoring based on the cost and energy performance of the renovation work (EUR 9,000 for a 7 points-roadmap and EUR 16,000 for a 26 points-roadmap).

Public/Private Partnership Financing scheme for homes energy renovations: Picardie Pass Rénovation

The French region of Picardie (now part of *Hauts de France*) has established a public funding mechanism for energy efficiency finance known as *Picardie Pass Rénovation*. The initiative is currently in a full-scale pilot stage and aims to deliver 2,000 residential renovation projects to reduce their current energy consumption by a target of 40 per cent. The regional authority set up Public Service for Energy Efficiency (PSEE) to provide a 'one stop shop' for home owners to receive technical as well as financial support to plan and implement the works²⁰.

The loan is fixed at 2.5 per cent interest over a 15- to 25-year repayment period and works on a 'pay as you save' principle. Borrowers repay the loan in monthly instalments calculated based on the predicted energy savings. To date, the average loan amount for single-family homes is around EUR 30,000 and EUR 14,000 for multi-family dwellings.

The energy assessment is undertaken by PSEE, which has expertise in building regulations, energy systems and typical renovation roadmaps for different types of houses in the region. The assessment involves a site visit to conduct the energy performance evaluation, and the elaboration of a renovation roadmap and cost assessment.

As part of the financial assessment, a risk rating is calculated based on the household income and the LTV. The energy assessment is based on energy bills (for several years, if possible), all technical data the owner can share, and an estimate of the thermal performance of the building envelope through visual checks and discussion with the owner.

PSEE supports the homeowner throughout the renovation works and provides 5 years of additional monitoring and advice on energy-efficient operation of the home.

²⁰ Read more here: <http://www.pass-renovation.picardie.fr/project-funded-by-europe/>

3.2.4 SEAI Deep retrofit Pilot Programme (Ireland)

In 2017, the Sustainable Energy Authority of Ireland (SEAI) launched a multi-annual pilot programme. The goal of the programme is to investigate the challenges and opportunities of deep energy retrofit in the Irish residential market. The agency, with the help of government funding will fund 50% of the total capital costs and project management costs combined. Funding will be provided to projects which demonstrate an integrated, comprehensive strategy for significantly improving home energy performance. It will fund up to 95% for voluntary housing association homes and the homes of those that are in energy poverty (based on the Warmer Homes Scheme eligibility criteria²¹).

Eligible projects must achieve all of the following criteria:

- i. Minimum Building Energy Rating (BER) of A3
- ii. A minimum BER uplift of 150 kWh/m²/year
- iii. Minimum air permeability of 5m³/h/m²

In the application form, each project is required to provide the following data:

- iv. Dwelling type
- v. Number of units
- vi. Year of construction
- vii. Pre-and post BER Grade
- viii. Pre and post kWh/m²/year
- ix. Pre and post Air Permeability Test
- x. Floor Area
- xi. Renewable construction

Eligibility criteria for upgrades are linked to a list of supported energy upgrade measures for insulations based on the U-value improvements; heating, ventilation and cooling equipment based on technology and performance criteria; and renewable energy contributions (calculated in kWh/m²/year). The SEAI application form includes a tool to calculate the project's energy savings given the upgrades and renovations undertaken and a value for money assessment (euros spent per kWh saved) (see Annex 8.4).

3.2.5 SEB Green Household Mortgages (Sweden)

As of end-May 2018, the Swedish bank, SEB, is offering a Green Household mortgage that provides preferential financial conditions (10bp-reduction from individual prices) to customers to buy an apartment or house that classifies as standard A or B label of the EPC (5%-7% of the building stock), derived from an energy declaration²². The energy declaration is a self assessment of the performance of the dwelling based on annual energy consumption (measured in kWh/m²/year) according to the netting of the consumption of the several housing

Building Energy Rating and Energy Performance Certificate in Ireland

A Building Energy Rating (BER) certificate indicates your building's energy performance. It is similar to the energy label for household appliances. The certificate rates your building on a scale of A-G. A-rated homes are the most energy efficient and will tend to have the lowest energy bills. G-rated are the least energy efficient.

The BER is calculated through energy use for space and hot water heating, ventilation, and lighting. The number of people likely to occupy a building is also taken in consideration. This is based on the average number of occupants in buildings of a similar size.

Ireland has one central EPC* database maintained and operated by the issuing authority for EPCs, the Sustainable Energy Authority of Ireland (SEAI). SEAI has a robust quality assurance system and a disciplinary procedure for EPC assessors, which includes both targeted and random audits of both EPC assessor and EPC assessments. Thanks to the online platform, end-users can easily access information on EPC legal requirements and EPC assessors and can access their property's certificate using its unique number or the serial number of the electricity meter. EPC assessors can log into the platform and upload certificates. Since 2012, the SEAI database has also operated as a national EPC research tool. The database is updated nightly, so up-to-date anonymised energy statistics on residential EPCs are widely available.

²¹ Applying to homeowners living in property built before 2006 and receiving welfare payments

²² See example here: <http://www.ekehielmstorget.se/f%C3%B6rvaltning-och-teknik/energideklaration-20297062>

equipment (heating, cooling, cooking, appliances) and the energy production of the renewable energy equipment. The declaration also comprises the full address, construction year and building type. Green mortgages portfolios are then refinanced using green covered bonds, in line with the bank's green bond framework.

3.3 Financing Energy Efficiency from a funding perspective

At the end of Q1 2018, EUR 122bn of green bonds have been issued in Europe since the launch of the first Green bond issued by EIB in 2007. In Europe in 2017, EUR 52bn of green bonds were issued with 48 first issuers. Among the 145 green bond issuers, 35 are financial institutions, totalling EUR 17bn issuance volume in 2017²³.

The present report focuses on "green bond" issuances as a refinancing tool for lending activities in the building sector incorporating energy performance and efficiency in their Use of Proceeds. The issuance of green bonds by financial institutions involves a substantial share of property financing (close to 40%). Banks have used mainly senior unsecured bonds to fund mortgage lending programmes for energy efficient homes (ABN AMRO, Barclays, KBC moer recently) and commercial properties (BerlinHyp, LBBW), but also covered bonds (BerlinHyp, Deutsche Hypo, SpareBank1) and MBS (OVG, Obvion; Fannie Mae in the US) (see Table 1).

"Green Funding Schemes"	Commercial Properties	Residential Properties
Green Covered Bond	Berlin Hyp Green Pfandbriefe (DE-2015,2016) Deutsche Hypo Green Pfandbriefe	SpareBank1 Boligkreditt (NO-2018) Caja Rural de Navarra (SP-2018)
Green Senior Unsecured	Berlin Hyp Green Senior Deutsche Hypo Green Senior	Barclay's Green Bond (UK-2018)
Green Senior Secured (MBS)	OVG (NL- 2016)	Fannie Mae Green RMBS (US) Rabobank-Obvion Green Storm (NL- 2017)

Table 1 Green Bond Market Overview

According to this approach several countries stand out as pioneers: Germany, The Netherlands, Spain, Norway, Sweden and the United States. Their initiatives and use of proceeds are described more in detail below.

3.3.1 Green Covered Bonds

A "green" covered bond is a debt instrument issued by a bank (the issuer) secured by assets that are considered to have a positive environmental impact (or a climate-related risk mitigation impact). After pioneering initiatives from Berlin Hyp; Munchener Hyp in Germany and Caja Rural de Navarra in Spain, the number of "green" bond issuances have grown significantly especially since end-year 2017 with 6 issuances from German banks (Berlin Hyp, Deutsche Hypo, LBBW) and Scandinavian banks (DNB, Sparebol, Landshypotek).

3.3.1.1 Caja Rural De Navarra Sustainable Cedulas (Spain)

Caja Rural de Navarra (hereafter CRN) is a cooperative, regional and retail focused bank that provides banking and financial services in northern Spain: Basque Country, Navarre and La Rioja. Caja Rural de Navarra is issuing a sustainability bond to finance lending to projects or activities that are focused on environmental sustainability and creating social impact in local communities. The projects funded through the bond will align with Caja's

²³ Read more in the CBI report: "The Green Bond Market In Europe" (2018)

internal sustainability principles as reflected in its Social Welfare Fund, and its core identity as a local and regionally focused cooperative.

Energy efficiency standards and targets are set according to the Spanish Building Construction regulation and Energy Performance Certificates (EPCs, in Spanish “Certificado de eficiencia energética”), both derived from European directives. They are calculated according to the building’s construction year and type (including the number of floors), the climate zone and the net contribution of renewable sources (the adjustment CO₂ to kWh is established at national level according to the electricity source mix). According to those criteria, energy efficient assets are:

Residential units (buildings/apartments/houses) whose date of completion and first delivery took place after 1st June 2013, that represent the top performing in terms of energy efficiency. CRN has decided to include only those units within the "A" and "B" categories, which are well below the 15% best performing threshold of the total stock (following CBI standard).

Residential units whose date of completion and first delivery took place before 1st June 2013, that either are included in the “A” or “B” categories or after retrofitting have achieved at least a 30% improvement in energy performance, leading to an EPC of “C” or superior. CRN will also include those loans granted to owners communities of residential blocks (“Comunidades de Vecinos”) to implement new complementary isolation and/or change in centralized heating leading to an EPC “C” or superior for the whole building. CRN will include units which -after retrofitting- attain the “A”, “B” and “C” categories, as any upgrade from “G”, “F”, “E” or “D” to the “C” category involves an improvement of at least 30% in energy efficiency (this also represents an improvement of 30% compared to the region’s housing stock average).

3.3.1.2 Berlin Hyp Green Pfandbriefe (Germany)

Berlin Hyp issues green bonds either as covered bonds (Green Pfandbriefe) or as senior unsecured bonds (Green Senior) and is committed to using the proceeds of these bonds for financing and/or refinancing loans for green commercial buildings. Berlin Hyp is a pioneer in green covered bonds with at least one issuance per year since the inaugural Green Pfandbrief in 2015. As such, in 2017 Berlin Hyp’s overall strategic goals is to achieve, by the end of 2020, that 20% of Berlin Hyp’s loan portfolio should consist of loans for green energy efficient buildings²⁴.

The selection of “Green Buildings” as eligible assets is carried out by Berlin Hyp AG’s Treasury Department. They are derived from the German Energy Savings Regulation (EnEV) and are subject to annual reverification by oekom. Green Buildings (energy efficient commercial or real estate buildings both new or existing) are defined with an energy demand or consumption (divided into heating and electricity) that should not exceed a certain threshold :

- i. 60 kWh/m²/year for residential properties (heating demand only),
- ii. 180 kWh/m²/year for Offices,
- iii. 135 kWh/m²/year for retail buildings,
- iv. 155 kWh/m²/year for hotels; and
- v. 65 kWh/m²/year for logistic buildings.

The eligibility criteria must be fulfilled such as the main decision criterion is the sum of the energy demand of heating and electricity. In order to prevent buildings with energetically poor building envelopes or a disproportional power requirement from being included in the green finance portfolio, the maximum values per energy demand category may not exceed the respective category threshold by more than 20% (excluding for residential).

²⁴ Read more on Berlin Hyp Green Bond Framework (2018) available here: <http://www.green-pfandbrief.com/home#home1>

In addition or alternatively, eligibility criteria include the following external sustainability certifications for which the minimum level standard can evolve over time to become more stringent.

- i. LEED
- ii. BREEAM
- iii. DGNB
- iv. HQE

Berlin Hyp also publishes an Impact Report that comprises an assessment of energy consumption savings avoided carbon emissions (kg.CO₂/m²/year). Quantification of impact on carbon emissions of a specific asset depends on the choice of a “baseline” (the carbon emission of a reference asset against which it is compared). Berlin Hyp, for transparency purposes, reports carbon savings measurements for two baselines: the first is an estimate of the average energy performance of existing European buildings, the second is the current energy reference value for each real estate asset class according to the German Energy Savings regulation (or EnEv). The latter is a more conservative measure in terms of carbon emission savings.

Carbon avoidance calculation methodology is based on a two-phase approach: first energy efficiency savings (kWh final/m²/year) are calculated per building by comparing each building’s energy efficiency to a baseline; second the carbon intensity of the energy saved (kgCO₂/m²/year) based on the country context.

The overall impact reporting assessment contains the following variables where a), b) and c) determine energy savings and d), e), f, g), i), j) determine the carbon intensity of the energy saved based on the target country:

- a) Assessment of each building’s energy consumption (kWh final/m²*year)
- b) Choice of the energy consumption baseline (kWh final/m²*year)
- c) Calculation of savings in energy efficiency (a –b) (kWh final/m²*year)
- d) Determination of the carbon intensity of commercial buildings in each country given its energy mix (kg CO₂/kWh final)
- e) Calculation of carbon intensity savings (c*d) (kg CO₂/m²*year)
- f) Estimation of total carbon savings (e*rentable surface of the building) (kg CO₂/year)
- g) Initial Market Value of building (EUR mn) (Initial Loan / Initial Loan to Value (LTV))
- h) Outstanding nominal amount in the Green Finance Portfolio (EUR mn)
- i) Berlin Hyp share expressed as a percentage of the initial market value of asset (Initial LTV) (%)
- j) Estimation of financed carbon savings (f*i) (kg CO₂/year)

3.3.1.3 Deutsche Hypo Green Pfandbriefe (Germany)

In 2017, Deutsche Hypothekenbank AG (Deutsche Hypo) issued Green Pfandbriefe as well as Green Seniors to finance mortgage loans secured by commercial real estate mainly in Germany but also in Great Britain, BeNeLux, France, Spain and Poland.

Deutsch Hypo has established a Green Building Committee to define minimum requirements for inclusion of an asset in the green bond asset pool. Currently, Deutsche Hypo’s Green Building Committee has set the following minimum requirements for an asset to qualify as a Green Building:

Energy certificate (derived from the German EnEv) with a maximum end energy demand or consumption in kWh/m²/year by building type:

- 50 kWh/m²/year for new residential properties
- 75 kWh/ m²/year for old residential properties
- 30 kWh/ m²/year for logistics buildings
- 70 kWh/ m²/year for retail buildings (shopping malls, department stores)
- 95 kWh/ m²/year for other retail buildings
- 95 kWh/ m²/year for hotel buildings (up to 3 star hotels)

- 105 kWh/ m²/year for hotel buildings (4 to 5 star hotels)
- 110 kWh/ m²/year for production and storage buildings (with heating)
- 110 kWh/ m²/year for office buildings without air conditioning
- 135 kWh/ m²/year for office buildings with air conditioning

Additionally, Deutsche Hypo relies on the following green building certifications:

- LEED
- BREEAM
- DGNB
- HQE

In terms of reporting, Deutsche Hypo will publish Green Bond Reporting on its website on an annual basis. Moreover Deutsche Hypo has commissioned research from Oekom, an independent rating agency, to review the implementation of the Green Bond Principles and the sustainability quality of the Green Bond Programme. This Second Party Opinion will be published yearly on Deutsche Hypo's website.

The Green Bond Reporting will contain the following aggregated information:

- Volume of eligible assets in the green bond asset pool
- Energy Savings calculated in terms of kilowatt-hours. It corresponds to the energy (heat) saved by a green building by determining the difference between energy requirements (heat) and the chosen benchmark (either the current German Energy Savings Ordinance or the individual European average)
- Carbon avoidance of the loan (and the portfolio) in comparison to a relevant average (using national energy primary consumption and fuel mix) per EUR million of financing (kgCO₂/year/EURmn)
- Information on Green Buildings (e.g. green building certificates, location, sustainability criteria)

The Carbon avoidance as stated in the Impact reporting is calculated according to the following equation (provided by Deutsche Hypo):

$$\text{Green Building Energy Savings} = \frac{\left[\text{benchmark} \left(\frac{\text{kWh}}{\text{m}^2 \text{year}} \right) - \text{energy consumption} \left(\frac{\text{kWh}}{\text{m}^2 \text{year}} \right) \right] * \text{country carbon intensities} \left(\frac{\text{kgCO}_2}{\text{kWh}} \right) * \text{building area} (\text{m}^2) * \text{financing share} (\%)}{\text{Loan Volume} (\text{€mn})}$$

In actual values and as calculated as of March 2018, Deutsche Hypo's Green Buildings, which are characterised by an energy performance certificate (EUR 1,080 million), avoid, compared to the current German Energy Savings Ordinance (EnEV used as the benchmark for Germany), 8,774 tonnes of carbon emissions per year. Thus, per EUR 1 million of investment a total of 8,1 tonnes of carbon emissions is saved per year.

3.3.1.4 Landesbank Baden-Württemberg green Pfandbrief (Germany)

Landesbank Baden-Württemberg is one of Germany's largest banks. It issued its first Climate Bonds Certified Bond in February 2018 to finance loans related to low carbon buildings. This was the first Certified Climate Bond from a German bank and LBBW issued this bond with the intention of helping to develop this market in Germany.

3.3.1.5 DNB Boldigkreditt (Norway) Green Covered Bond

DNB Boligkreditt AS is the issuer of covered bonds in the DNB Group. The issuer is a wholly owned subsidiary of DNB Bank ASA. They issued their first green covered bond in June 2018 financing energy efficient residential buildings in Norway. DNB green bond is in line with the ICMA green bond principles, the CBI certification standards and the Energy Efficient Mortgage Action Plan (EeMAP).

The pool will comprise residential buildings built under the national building codes TEK10 or TEK17 that insure a maximum calculated energy consumption of 110 kWh/m²/year for apartment and 126 kWh/m²/year for other dwellings. In their impact reporting, DNB will provide both estimated energy consumption savings and Carbon emission savings.

3.3.1.6 SpareBank 1 Boligkreditt (Norway)

SpareBank 1 Boligkreditt is a Norwegian covered bond issuer jointly owned by the saving banks working closely together under the SpareBank 1 brand. In January 2018 SparBol issued Norway's first green bond backed by mortgages on energy efficient buildings (Green RMBS). The covered pool consists of high quality Norwegian residential mortgages, as well as liquid assets.

Eligibility criteria: Sparbol has identified three eligibility criteria for Greens on energy efficient buildings. These criteria follow the CBI approach and state that eligible residential buildings must meet one or more of the following criteria;

- i. New or existing Norwegian residential buildings that comply with the Norwegian building codes of 2007 (TEK07), 2010 (TEK10) or 2017 (TEK17) are eligible for green bonds as all these buildings have significant better energy standards and account for less than 15 % of the residential building stock
- ii. Existing Norwegian residential buildings built using older building codes than TEK07 with EPC-labels A, B and C. These buildings may be identified in data from the Energy Performance Certificate (EPC) database.
- iii. Refurbished Norwegian residential buildings with at least a 30% improvement in energy efficiency measured in specific energy, kWh/m², compared to the calculated demand based on building code in the year of construction. These buildings may be identified using the EPC database (comparing calculated energy use available in the database with calculated demand based on relevant building code for year of construction).

Building codes: Changes in Norwegian building code have consistently over several decades resulted in more energy efficient buildings. All residential buildings built according to TEK07, TEK10 and TEK17 are deemed energy efficient as they are the top 8% energy efficient buildings in the country. Net energy demand is calculated for model buildings used for defining the building code (TEK7/TEK10/TEK17), theoretical values for representative models of an apartment and a detached and semi-detached residential dwelling, calculated in the computer programme SIMIEN and in accordance to Norwegian Standard NS 3031:2014 (Calculation of energy performance of buildings Method and data), and not based on measured energy use. This is the same methodology as used in the EPC system.

EPC data issuance and availability: Enova, which is responsible for the EPC system in Norway, aims to make the register publicly available and accessible, and several banks and other financial interests have already initiated this for the Ministry. However, an amendment of today's regulations will be necessary. For now, calculated consumptions and EPC are obtained manually, address by address, on the EPC homepage (<https://www.energimerking.no/no>).

Carbon footprint equivalence: To calculate the CO₂ factor (CO₂/kWh), third party verifier (Muiltconsult) uses the Norwegian energy production mix and the BREEAM environmental classification system in its Norwegian version. The energy demand in Norwegian households is covered by electricity (79 %), fossil oil and gas (4 %) and bioenergy etc. (16 %) (Statistics Norway, 2013). In 2016, the Norwegian power production was 98 % renewable (NVE) which gives resulting emissions of 10 gCO₂/kWh. Using BREEAM factors and the energy mix in Norwegian residential buildings, the resulting CO₂- factor is 126 g CO₂/kWh (Multiconsult Based on building code assignments for DiBK).

3.3.2 Green Mortgage Backed Securities

3.3.2.1 Rabobank And Obvion Green Storm Program (The Netherlands)

In 2017, Obvion N.V., a Dutch mortgage provider and a wholly owned subsidiary of Rabobank (Coöperative Rabobank U.A.)²⁵ launched a green residential mortgage backed security (RMBS) issuance based on a green mortgage program called “GREEN STORM”²⁶. The program aims to refinance a mortgage asset pool with added environmental value, in line with ICMA Green Bond Principles²⁷ (hereafter GBP), Netherlands Energy Agreement for Sustainable Growth and CBI’s Standard for Low Carbon Buildings.

Green Mortgages are selected according to energy efficiency and energy performance criteria based on the construction year and Dutch Energy Performance Certificates which are derived from the revised 2010 EPBD. Obvion selected mortgage loans connected to buildings with an A label or B label with a construction year from 2002 onwards as they represent the top 15% of the Dutch residential building stock in terms of energy performance (in compliance with CBI standard). For the older building stock, Obvion selected houses with improved (refurbished) energy efficiency to at least a definitive label A and those houses that have improved by at least two notches from the original EPC to the definitive Energy Performance Certificate B or C (as a proxy for at least 30% improvement of energy efficiency) provided by the RVO database, both according to the national construction norm (NEN7120+NV.F). In order to identify the current EPCs of Obvion’s mortgage pool, Obvion matched all postal codes and addresses of the residential buildings that serve as collateral to the mortgage loans with externally provided EPC data. The data was provided by real estate data provider **Calcasa**. In case the definitive EPCs were not available the label was calculated by Calcasa based on the official EPC methodology.

3.3.2.2 OVG Real Estate and ABN AMRO

In 2016, ABN AMRO and OVG Real Estate collaborated to develop a financing framework according to the Green Bond Principles in order to issue a mortgage backed green loan to finance energy efficiency upgrades in commercial buildings in the Netherlands. The buildings involved meet the CBI standard.

3.3.2.3 Fannie Mae Green RMBS (USA)

The north American specialised bank Fannie Mae launched its First Multi-Family Green Mortgage product in 2011. In 2017, the green financing portfolio amounts to \$31bn (\$26.7bn in green MBS and \$3.4bn though its Guaranteed Multifamily Structures Green or GeMS).

Eligibility Criteria: Fannie Mae finances energy upgrades under three conditions: (i) the energy savings must attain at least 25%; (ii) retrofit expenditures must be equal or more than 5% of the original mortgage amount and (iii) retrofits must be undertaken within 12 months. For energy performance certification, Fannie Mae relies on a list of recognized labels and certification systems:

- i. Earthcraft
- ii. ENERGY STAR
- iii. Entreprise Green Communities
- iv. Green Globes
- v. GreenPoint Rated
- vi. LEED: US Certification System for residential and commercial buildings used worldwide; LEED covers the design, construction, maintenance and operation of buildings
- vii. National Green Building Standards

Green MBS assets must also produce a “High Building Performance report” with extra requirements:

²⁵ In 2016, Rabobank’s and Obvion’s share of the Dutch mortgage market amounted to 17.3% and 3.2% respectively.

²⁶ The security will be structured in line of Obvion’s 17.9bn euros residential mortgage securitisation program: STORM.

²⁷ Rabobank is member of the executive board of the GBP

- i. Level 11 Energy Audit
- ii. Additional requirements (form 4099 of the PCA)
- iii. ENERGY STAR 1-100 score and EPA water 1-100

3.3.3 Green senior unsecured bond

3.3.3.1 Barclays' green senior unsecured bond (United Kingdom)

In November 2017, Barclays issued a green bond (MREL eligible senior unsecured green bond) that aims at financing and refinancing Barclays' residential mortgages on properties situated in England and Wales which are in the top 15% of the lowest carbon intensive buildings in these countries, based on estimated energy efficiency. Barclays was able to identify these properties thanks to the publication of EPC data for UK buildings by the UK government. In 2017, the Department for Communities and Local Government (DCLG) released data relating to all EPCs reported in England and Wales until December 2016, comprising around 16 million records. This comprehensive data set has allowed Barclays to identify and map EPC data against properties in Barclays' mortgage portfolio.

To comply with CBI's Standard, only properties that meet the top 15% carbon intensity threshold in terms of estimated emissions performance in their local market are considered to qualify. Analysis by the Carbon Trust at the time of writing shows that the top 15% carbon intensity threshold for properties within the DCLG's dataset was found to be equivalent to a performance of 28 kgCO₂/m²/year.

3.3.3.2 KBC Group Green Bond (Belgium)

KBC Group is a European financial group with a focus on providing bank-insurance products and services to retail, SME and mid-cap clients. KBC issued in June 2018 its first green bond that will be used to finance projects in a range of sectors, including an offshore wind farm in the North Sea and refinancing over 2000 mortgage loans tied in energy efficient homes in Belgium (Flanders).

Eligibility criteria: KBC "green energy loans" will finance home improvements where at least 50% of the home improvements are for energy-efficiency purposes, including the following renovation roadmap:

- i. new central heating or solar boilers
- ii. water pumps and other geothermal energy systems
- iii. high-efficiency glazing
- iv. new insulation
- v. thermostatic taps
- vi. solar panels
- vii. energy audits

Residential real estate loans for new constructed energy efficient residential buildings in the Flemish Region must comply to the "Energieprestatie en Binnenklimaat" (EPB) requirements included in the building code of the Flemish Region as of 2014 or later (E-level ≤ 60) and for which the first drawdown has occurred after January 1, 2016.

Commercial real estate buildings are eligible if they belong to the top 15% (CBI "best in class indicator" of the commercial real estate building stock in terms of energy performance in the country of location, or which have obtained any of the following green building certificates:

- LEED: [≥ "Gold"]
- BREEAM: [≥ "Very Good"]
- HQE: [≥ "Excellent"]

In terms of impact reporting, KBC will annually report on the following indicators based on construction dates and certifications obtained:

- Estimated annual energy savings in MWh or GWh compared to a baseline
- Estimated annual GHG emissions avoided/reduced in tons of CO₂e

3.3.3.3 ABN AMRO Green Bond Framework

ABN AMRO (Netherlands) issued three Green Bonds in June 2015, May 2016 and April 2018 to finance loans related to residential and commercial buildings that meet certain energy efficiency or low carbon criteria, defined in their Green Bond Framework, updated in April 2018. They are senior unsecured bonds which rank pari passu with all other senior bonds of the issuer and are issued out of the Euro Medium Term Notes programme.

Regarding the eligibility criteria related to the energy performance in the real-estate sector, the Energy Efficiency Criteria used in this framework are of four types:

- i. national buildings codes (indicated by the construction dates),
- ii. green building certifications (international: LEED and BREEAM and national schemes: GPR building score and RVO green building funding scheme),
- iii. expected energy or CO₂ emission reductions determined by certified and independent EPA advisors,
- iv. energy Performance Certificates issued by the national agency (RVO).

The framework distinguishes four categories, commercial loans, residential mortgage loans for green new buildings and commercial and residential real estate loans for energy upgrades:

Residential mortgage loans for energy efficient buildings: Mortgage loans to finance new Residential buildings must comply with the Dutch Building Decree 20121 (Bouwbesluit 2012: Chapter 5 and NEN 7120²⁸) and for which the first drawdown has occurred after 1-1-2015.

Commercial Real Estate loans for energy efficient and/or sustainable buildings: Commercial Real Estate loans or investments for new and existing building projects in the asset classes offices, retail stores, residential housing projects, data centres, leisure and logistics must fulfil the criteria below:

- i. Loans or investments for which the first drawdown has occurred after 1-1-2015 (energy performance established from the building codes stringency and are based on the construction year)
- ii. For existing and new building projects, projects which obtained an Energy Performance Certificate (EPC) as issued by RVO (Netherlands Enterprise Agency, which is the executive body for the implementation of the EU Energy Performance of Buildings Directive in the Netherlands) with a minimum Energy Performance labelled “A” or better (currently ranging up to A++++ and down to G)
- iii. For new building projects, the projects should have received an environmental certification, or will receive such a certification within six months after completion of the project. The certificates per asset class and building types are set according to the gross floor area and the Green building certification score (BREEAM, LEED or GPR) or according to the allocation of RVO Green funds sustainable buildings funding scheme 2017.

²⁸ The NEN Criteria describes the term, definitions and the method to determine the indicator of energy performance of a building which results in an energy performance coefficient.

Residential and commercial Real Estate loans for energy efficiency upgrades: Loans or investments for existing building projects in the asset classes offices, retail stores, residential housing projects, data centres, leisure and logistics, where efficiency improvements have been - or will be- made, which fulfil the criteria below:

- i. Loans or investments for which the first drawdown has occurred after 1-1-2015
- ii. The emissions reduction of the property per square meter across the portfolio is 30% or higher for bonds with a tenor of 5 year. For longer maturities, the average required emissions reduction increases with 0.8% per year
- iii. In case of building transformation for the respective asset class 8 or a renovation that changes the characteristics of the building in such a way that a reliable calculation of energy efficiency improvement is not possible or relevant, the energy emissions reduction of the project will be evidenced by an EPC labelled "A", issued by RVO (Netherlands Enterprise Agency, Rijksdienst voor Ondernemend Nederland, (www.rvo.nl))
- iv. In case the renovation or transformation is not finalised yet, indicative measures will be used, and a final EPC will be required six months after completion of the renovation/transformation
- v. The energy reduction of the energy efficiency improvements will be determined by an independent EPA advisor in accordance with the requirements of the Energy Performance of Buildings Directive (EPBD) of the European Union. In the Netherlands, the EPA advisor needs to be certified in accordance with the BRL9500 for the respective asset class (NL-EPBD process certificate). The assessment is based on the definitions, methodology and calculation methods as set out in the national norm NEN7120 and ISO 75.3 (where applicable) or its successors. In case a sensible calculation cannot be provided, an expert opinion on the expected Energy usage/CO₂ reduction can be used.

On an annual basis, ABN AMRO will provide an impact report. The methodologies and calculation model used to estimate the impact are developed by an independent external consultant. The results will be published via ABN AMRO's corporate website (<http://www.abnamro.com/greenbonds>), including newsletters and/or sustainability reporting.

Sector		Impact reporting Indicators
Residential	1	% of buildings with primary energy consumption below 70 kWh/m ²
	2	% of buildings that comply to Dutch Building Code 2012 (Bouwbesluit and NEN 7120)
	3	Energy Performance Coefficient levels
	4	Average Energy consumption of the buildings financed through the loans / average energy cons. In the Netherlands
	5	Average CO ₂ emissions of residential buildings (in g/m ²) financed through the loans compared to the average CO ₂ emissions of residential buildings in the Netherlands (based on the carbon intensity of the Dutch energy mix)
Commercial	1	Percentage of residential buildings that comply with the Dutch Building Decree 2012 (Bouwbesluit 2012: Chapter 5 and NEN 7120)
	2	Distribution of Energy Performance Coefficient levels and Energy Performance Certifications ("Energy labels") among the buildings
	3	Percentage of offices that are located within a maximum of 1 km from two or more modalities of public transport (newly constructed buildings)
	4	Average annual energy consumption of residential buildings, offices, retail stores and/or logistics centres compared to average energy consumption per residential building, office space or retail store in the Netherlands (in kWh/m ²)
	5	Average CO ₂ emissions of residential buildings, offices, retail stores and/or logistics centres (in g/m ²) financed through the loans compared to the average CO ₂ emissions of equivalent buildings in the Netherlands (based on the carbon intensity of the Dutch energy mix)



	6	Percentage of building projects with gross floor areas bigger than 5,000 m ² which have at least a BREEAM "Very Good" or LEED "Gold" completion certificate (newly constructed buildings) or GPR Building score of "7.5" or RVO Green funds sustainable buildings funding scheme 2010
	7	Percentage of building projects with gross floor areas smaller than 5,000 m ² which have at least a BREEAM "Very Good" or LEED "Gold" indicative label (newly constructed buildings) or GPR Building score of "7.5" or RVO Green funds sustainable buildings funding scheme 2010
Energy Upgrades	1	Percentage of expected and, if available, realized CO ₂ emission reduction related to the upgrade/renovation of commercial and/or residential real estate
	2	Distribution of Energy Performance Certificate issued by RVO (Netherlands Enterprise Agency, Rijksdienst voor Ondernemend Nederland) before and after the energy efficiency upgrade, except in case of transformation projects. For the latter only the final Energy Performance Certificate will be reported.

The expected emission reduction will be calculated based on the expected energy reduction, the energy mix and the Dutch greenhouse gas conversion factors for electricity of undefined energy source and natural gas (derived from the Dutch CO₂-database available at www.co2emissiefactoren.nl).

4. Energy Efficiency Reporting Criteria: Takeaways

4.1 Energy Efficiency available criteria

The mapping presented in sections 2 and 3 allow us to identify a shortlist of energy efficiency reporting criteria and order these in terms of relevance for the purposes of EeDaPP.

1. Energy Performance Certificates (EPCs)

Research in the context of EeMAP suggests that, despite their shortcomings, EPCs represent the most usable tool at the European level. EeMAP research and recommendations indicate that EPC stemming from European legislation are a useful and practical first step as a common energy efficiency criterion for a pan-European energy efficient mortgage market. There are however two caveats to their use. First, EPC lack full coverage of the European building stock, although coverage is broadening over time. Second, EPC calculation methods differ from country to country and can use either modelled or real energy consumption. This nuance has important consequences in terms of performance monitoring and data sourcing. It is therefore necessary to include other EE metrics in the EEM reporting template.

2. Building Codes

Building construction codes stem from national legislation that sets minimum performance and energy consumption levels to new buildings, either residential or commercial. They allow for minimum energy performance standards to be derived for buildings built at a specific period of time. Due to the simplicity of this allocation, building codes is the EE criteria widely used by actors in the market, using construction year as an energy performance breakdown for the building stock.

3. Building Labels

Building labels and certifications are widely used in the market, especially to finance “green” commercial real-estate. Internationally recognised labels and certifications such as BREEAM, DGNB, HQE and LEED are useful to assess the energy and environmental performance of new buildings located in several EU Member States. Nationally designed labels are also used upon the quality and the stringency of their methodology, aligned with national energy policies.

A desirable feature, present in both building codes and labels EE criteria is their ability to adapt the stringency of an energy efficient building selection over time and make it evolve to align gradually to long term climate goals and energy efficiency evolving policies.

4. Renovation Roadmap and Building Envelope upgrades

Building energy performance and consumption is linked to the building’s thermal properties (building envelope and thermal isolation) and the heating and cooling equipment (performance and type and fuel). To achieve a targeted level of energy efficiency, existing buildings must undergo energy renovation and upgrades that will improve the performance of the property envelope and equipment. Some financing schemes such as EcoPTZ in France or KfW energy renovation program and Effizienzhaus label in Germany rely on a renovation roadmap, that is a certified list of eligible work to ensure the energy efficiency of property upgrades. To ensure that the renovation work will effectively achieve energy performance minimum standards (measured in building envelope thermic value), schemes rely on SME certifications and label such as the RGE label in France or the Effizienzhaus in Germany.

5. Retrofit costs and Net Present Value

Energy retrofits are costly. The initial investment needed to perform energy upgrades often offset the investment needed for property renovation that do not refer to energy performance targets. The economic profitability of the renovation roadmap eligible to achieve energy efficiency standards is taken into account into

several financing schemes such as in Germany and in France. This indicator is necessary at origination to determine the definitive loan or mortgage amount necessary (as proceeded for social housing financing by the Caisse des Dépôts Group). Nevertheless, data collection and comparability for this indicator remain challenging as it is deeply intertwined with national standards, practices and economic environment.

6. Energy Expenditures

The EeMAP technical reports on building performance indicators and on the impact of energy efficiency on probability of default indicate that the energy performance of a house or a building can impact the default risk rate of the borrower via the cash flow channel. Energy efficiency leading to lower energy final consumption hence results in lower energy expenditures. Moreover, we have seen by way of the retail market mapping that some financing schemes (Third party financing such as the *Pass Picardie Renovation* in France) rely on the energy expenditures differential to pay back energy efficiency investments. The challenges here are twofold. First, data are related to the building's real energy consumption and can be affected by the energy efficiency gap described earlier. Second, the periodicity and the sourcing of the information are different whether it comes from a smart metering system (continuous information held by both the utility and the household) or invoices that can be provided on a monthly/quarterly/annual basis by the borrower.

7. Green Property Value

EeMAP technical reports on Mortgage Lending Valuation and the Impact of Energy Efficiency and on the Impact of Energy Efficiency on the Probability of Default both provide first conclusions and recommendations on the impact of energy efficient mortgages on credit risk as a result of green property premium and increased disposable income (via lower energy expenses). Further work is being undertaken on the correlation between energy efficiency and credit risk, notably to provide statistical evidence that borrowers with energy efficient mortgages have a lower Probability of Default (PD) and the value of the property is higher. Hence, energy efficiency financing schemes should provide some reporting to help conduct this evaluation. Moreover, loan to value information is comprised in the financial reporting criteria described in the following section.

Green Property value can be measured by a valuation before and after the energy efficiency upgrades. It can also be assessed using the market intrinsic value of the different building labels, knowing that some labels include more than just energy performance, for example, environmental amenities and quality of life factors.

8. Best in Class 15% indicator

The market systematically uses third party certification for green bond issuances and the CBI is the main certification body for European issuers financing activities in the real-estate sector. Therefore, we recommend including CBI's 15% "best in class" indicator within the data reporting requirements regarding energy efficiency criteria. The challenge to be addressed in the next reports is to establish common standards for the market relevant benchmark.

9. Energy consumption and savings

Energy consumption savings indicators are present as a KPI for financing schemes at the retail level and as a green bond certification criterion. They are also a key element of measuring energy efficiency for existing and old buildings where building codes and labels cannot correctly assess the energy performance. How the energy consumption is measured will be the key challenge to address when establishing European level financing scheme and reporting criteria. From market initiatives, the energy consumption savings eligibility target ranges from 25% (Fannie Mae) to 50% (KBC Group).

10. Carbon savings

For Green Bond certification purposes, banks include in the "impact reporting" of their financing activities the equivalent in carbon emission saved compared to a relevant baseline (equivalent but "non-energy performant" assets), this indicator is often put in relative terms to their overall invested amount and as a share to the overall

asset's sector. Carbon savings are also calculated for policy perspectives to assess the alignment of the “green” financing activity to national and European sustainable energy and climate policies.

4.2 Commonalities and control variables

In analysing data related to energy efficiency to determine the EPC, Building code, labels, energy consumption and carbon emission targets, modelling and control variables are used that can be related to the borrower (household), the building, or the environment (local, economic or climatic) and be available from multiple sources (the borrower, the bank or mortgage servicer, the valuer, the Energy expert) or be publicly available (via institutional statistics agencies). They are summarised in the table below:

Category	Variable Description	Potential Data Source
Borrower Information	Age	Mortgage Servicer System
	Employment status	Mortgage Servicer System
	Income	Mortgage Servicer System
	Type and size	Mortgage Servicer System
	Occupancy rate	Mortgage Servicer System
	Seniority	Mortgage Servicer System
	Education	Mortgage Servicer System
Property Information	Building codes	Valuation report
	Construction year	Valuation report
	Building type	Valuation report
	Floor number	Borrower
	Postcode or Zipcode	Valuation report
	Address	Valuation report
	Property rentable area	Valuation report
	Number of bedrooms	Borrower
	Occupancy information	Borrower
	Total floor area (m ²)	Valuation report
	Zip code location	Valuation report
	Original value at mortgage origination	Mortgage Servicer System
	Heating fuel type	Borrower
	Price per square meter	Derived Information
	Existing Green Certification	Valuation Report
EE Certification Provider (audit or energy renovation builder)	EE Certification Provider	
Location/Environment information (optional)	Cooling/Heating degree-days	Public
	Distance to central business district	Derived information
	Distance to closest public transportation hub	Derived information
	Electricity price	Public
	Local Energy Mix	Public
	Number of foreclosures	Public/Institutional
	Unemployment rate	Public

4.3 Summary table and temporary assumptions

The criteria can relate to: the borrower (energy expenditures, property value), the building (building codes and labels), the energy efficiency investment (renovation roadmap, net present value, SME certification) and finally the bank's loan portfolio (Best in class indicator, carbon savings). Note that some criteria refer to specific market scope: building codes and labels are used to assess new and energy performant buildings whereas renovation roadmaps, energy expenditures and SME certifications are linked to the energy efficiency monitoring in property upgrades (summarised in Table 2. Please note that temporary assumptions has been made on the periodicity , the source and the quality assessment of the following variable. Technical aspects and feasibilty of such reporting will be assesed in further details by EeDaPP future work and publications.

EE Criteria	Type and Unit	Sourcing	Periodicity	Quality Assessment
1. Energy Performance Certificates (EPC)	Ranked grades (From A to G)	Borrower/Energy Efficiency Expert	Two cases: New or already efficient buildings: once Energy Renovation: before and after works	“best in class” approach and benchmarking
2. Building codes 3. (following construction legislation)	Construction year	Borrower (construction year)	Once at mortgage origination	“best in class” approach and benchmarking
4. Building Labels and Certifications	Labels and ranks (Gold, Silver, Bronze or Good, High, Excellent).	Building Councils	Label delivered after construction (new buildings) or after upgrades	
5. Energy Bills reductions	in € per month/trimester/year/lifecycle	Households/Utilities	Monthly/Quarterly /Yearly	Invoices or Energy Provider assessment
6. Energy savings	% changes in kwh/m ² /year	Households/Utilities	Monthly/Quarterly/Yearly or continuous (Smart Metering)	Modelled vs. empirical
7. Green Property Value	in €, m ² equivalent or % of the asset original value	Valuer	Two references inputs: pre- and post-energy retrofits	Benchmark
8. Renovation roadmap	Qualitative listing of eligible energy retrofit (can be transposed in energy savings, EPC grade nudges or U-values)	Energy Efficiency Expert via an Energy Audit	Two reference inputs (audit reports): pre- and post-energy retrofits	Certified Energy Auditor or list of eligible costs certified by public institution (at European Level) coupled with SMEs certification scheme
9. SME Certification and or Labels	Qualitative label (yes/no box)	SME Certifiers and/or Insurer	Once	Benchmark, Certification assessor
10. Building Envelope U-values (upgrades in the building’s thermal performance)	U-value: W/m ² •K for each of the relevant building component (roof, ceiling, walls, windows and doors)	Energy Audit	Two inputs (pre- and post-refurbishments) Yearly for new buildings	Benchmark, Energy Audit with Thermal performance assessment
11. 15% “Best in class” quintile indicator	Quintile distribution (5-10 or 15% best in class)	Macro-level certification body	Yearly	Impact Reporting from independent rating agency
12. Carbon emission savings	tCO ₂ per unit, CO ₂ Equivalent emission reductions. kgCO ₂ /year/€mn invested (at loan or portfolio level)	Macro-level certification body	Yearly	Impact Reporting from independent rating agency

Table 2 Summary table of Energy Efficiency Criteria

5. Financial Reporting Criteria

5.1 European Central Bank's (ECB) Asset Backed Security Loan Level Initiative

The obvious starting point to identify financial variables to underpin the Energy Efficient Data Protocol and Portal is the European Central Bank's (ECB) Asset-Backed Security (ABS) Loan Level Initiative launched in 2012. This Eurozone initiative is intended to standardise information on ABS accepted as collateral in Eurosystem credit operations. It was put forward by the ECB as a response to the 2008 financial crisis to restore confidence in the securitisations market.

As explained on the ECB website²⁹: *"The ABS Loan Level Initiative establishes specific loan-by-loan information requirements for asset-backed securities (ABSs) accepted as collateral in Eurosystem credit operations. It increases transparency and makes available more timely information on the underlying loans and their performance to market participants in a standard format. In the past, assessments of asset-backed securities have been hampered by the lack of standardised, timely and accurate information on single loan exposures. The Eurosystem believes that the data requirements will help both investors and third-party assessment providers with their due diligence. Ultimately, greater transparency will help to restore confidence in the securitisation market."*

Loan-by-loan information requirements for residential mortgage-backed securities (RMBS) began in January 2013; the loan-by-loan requirements for commercial mortgage-backed securities (CMBS) began in March 2013. The requirements apply to both existing and newly issued ABSs.

The reporting templates (see Appendix 8.3) are intended to improve transparency, give investors access to loan-level data, as well as ensure that rating agencies and other market participants have the information they need to update their credit and cash flow models. The templates are designed to ensure compliance with the data protection, banking secrecy and confidentiality regulations.

These templates therefore serve as a very useful starting point to map the type of loan level data reporting requirements specific to mortgage backed securities, including 69 mandatory and 113 optional fields for RMBS and 354 mandatory and 79 optional fields for CMBS, with the optional fields cover either country or deal specific fields or are requested for the specific needs of a rating agency.

The European Datawarehouse (ED), one of the EeDaPP Consortium Partners, receives the loan-level data from loan originators, or their systems providers of choice, checks it for compliance against the ECB templates, and ensures that it is openly accessible to the market and that all transactions are recorded.

5.2 Bank of England (BoE) Eligible Collateral Templates

The Bank of England (BoE) has published similar data (residential/commercial loan collateral) templates (Appendix 8.3) to those published by the ECB for the purposes of loan collateral eligibility in the context of its market operations. The residential loan collateral templates have been mandatory since December 2011 and have 111 mandatory and 97 optional data fields. The commercial loan collateral templates have been mandatory since January 2013 and include 304 mandatory and 74 optional data fields.

The main systemic differences compared to the ECB templates relate to the absence in the BoE template of a systematic logic to capture why there is no data for certain fields and the fact that the BoE does not have a score to calculate the completeness of the loan level data file submissions.

The guidelines accompanying both the ECB and the BoE templates also differ slightly in respect to definitions. Consistency with the loan-level-data definitions is also less stringent than that of the ECB; with regard to the ECB templates, one cannot upload a completed ECB template onto the European Datawarehouse data repository which does not fully comply with the underlying data field definitions.

²⁹ <https://www.ecb.europa.eu/paym/coll/loanlevel/html/index.en.html>

One further difference, as implied above, is that the BoE does not have a centralised portal like the European Datawarehouse which manages the loan-level data of the ECB's templates and quality checks them.

On content specifically in relation to the residential mortgage template, the data fields are very similar, although the BoE template requires greater granularity than the ECB template in terms of creditworthiness assessment-related information.

5.3 European Banking Authority (EBA) Non Performing Loan Transaction Templates

In December 2017, the European Banking Authority (EBA) published non performing loan (NPL) transaction templates (see Appendix 8.3) aimed at enhancing standardisation of NPL-related data and at reducing information asymmetries between potential buyers and sellers of NPLs portfolios. They also aim at enhancing the granularity, quality and comparability of NPL data and at increasing transparency and market certainty.

The EBA NPL transaction templates, which among other things includes residential and commercial templates, provide data loan by loan including information on counterparties related to the loan and the collateral provided. The templates are built on existing reporting³⁰ to reduce implementation costs for banks. They also provide a common EU data set but bespoke parts of the templates capture national specificities. As opposed to the ECB and BoE templates, the EBA templates do not categorise the different data fields into mandatory vs optional, but instead divide the fields into categories of moderate, important and critical information.

The EBA also provides an NPL portfolio screening template which includes information commonly required to perform a market sounding exercise. In this template, stratified data provides a high-level view of an NPL portfolio to investors and other third parties potentially involved in transactions. The EBA NPL screening template aims at enabling potential bidders to perform an initial screening, commonly performed during the first phase of an intended NPL transaction. Any party involved in such a transaction may request further data, not included in the EBA NPL screening template. The EBA NPL portfolio screening template includes information on an aggregated level, which is covered by the EBA NPL transaction templates, e.g. on a loan by loan or collateral by collateral level.

5.4 Commonalities

Analysis of the three reporting templates points to the following categories of mandatory information as being typical for loan-level reporting for residential mortgage loans:

- **Borrower data:**
 - Borrower employment status
 - Income
 - Location
- **Loan data:**
 - Loan origination date, maturity & term
 - Loan purpose & type
 - Original and current loan balance
 - Interest type, index, margin
- **Property data:**

³⁰ The definitions and references used in the EBA NPL transaction templates build upon relevant provisions of the CRR as well as upon provisions and comparable data fields included in: (a) Implementing Regulation (EU) No 680/2014 of 16 April 2014 laying down implementing technical standards with regard to supervisory reporting of institutions according to Regulation (EU) No 575/2013 of the European Parliament and of the Council (FINREP Regulation); (b) Regulation (EU) 2016/867 of the European Central Bank on collection of granular credit and credit risk data (AnaCredit); (c) Regulation (EU) No 1893/2006 on establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No 3037/90 as well as certain EC Regulations on specific statistical domains (NACE); (d) ISO Codes; and the Nomenclature of Units for Territorial Statistics (NUTS3) as laid out by Eurostat. This to ensure the maximum consistency possible with existing definitions.

-
- Property location & type
 - (Current) valuation amount
 - Original Loan to Value & Current Loan to Value
 - (Current) valuation type & (current) date
 - **Performance data:**
 - Arrear status, arrears/default/litigation
 - Price achieved on sale, recoveries, losses
 - Probability of Default (PD)
 - PD Revision date

As indicated, optional information included in these reporting templates variously includes:

- Borrower characteristics (foreign national, resident, year of birth, first-time buyer)
- Country specific fields (number of CCJ – UK, Bureau Kredit Registratie 1-10 – Credit Type NL,..)
- Principal grace period, occupancy type (owner occupied vs. rented)

In respect to commercial mortgage loans, the findings are somewhat similar but more exhaustive, with the number of mandatory data points (facts, numeric, list, Y/N) required for commercial asset-level data being more complex, especially in respect to loan, property and bond information. For obvious reasons, the borrower focus differs for commercial and is also more emphasised from a performance perspective, i.e. key (risk) parameters and repayment schedules.

In addition, key identifier data shall appear on the final reporting criteria covering all reporting parties involved: originator, upload agent, pool identifier, transaction identification, loan identification etc. Further assessments and assumptions on data availability, accessibility and encryption. It will be the subject of further EeDaPP researches and publications.



6. Conclusions and Next steps

The EeDaPP Initiative aims to design and structure a platform that is relevant to the different stakeholders, including strategic elements such as bank risk profile and capital cost, energy consumption data, retrofit costs and profitability and building performance monitoring and insurance.

With the present report and the subsequent work to be conducted by the EeDaPP consortium partners in mind, it is possible to identify a minimum common denominator that is transparent, yet rigorous for the selection, financing and certification of energy efficiency loans that ultimately give rise to a new asset class. Taking the present analysis as the starting point, in its subsequent analyses, the EeDaPP Consortium will address market gaps and finally define common, minimum pan-European reporting standards for energy efficiency data gathering, processing and disclosure.

The reporting framework must also be built according to the data sensibility and specificity of each of the reporting sources (households, banks, valuers, energy experts and public institutions). The forthcoming EeDaPP report on existing data reporting frameworks and templates will help to address this issue.

7. Bibliography

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EeMAP Review of the State of Play of Green Finance

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EeMAP Consumer Insights Research

Madlener, Reinhard, and Maximilian Hauertmann. 2011. Rebound Effects in German Residential Heating: Do Ownership and Income Matter? E.ON Energy Research Center, Future Energy Consumer Needs and Behavior (FCN). FCN Working Paper.

8. Appendix

8.1 List of EU level Financing Schemes and relevant EU funded Projects

NAME	Description	Link
ELENA	ELENA is a joint initiative by the EIB and the European Commission under the Horizon 2020 programme. ELENA provides grants for technical assistance focused on the implementation of energy efficiency, distributed renewable energy and urban transport projects and programmes. The grant can be used to finance costs related to feasibility and market studies, programme structuring, business plans, energy audits and financial structuring, as well as to the preparation of tendering procedures, contractual arrangements and project implementation units.	http://www.eib.org/products/advising/elena/index.htm
Private Finance for Energy Efficiency (PF4EE)	EE loans means loans signed by a Financial Intermediary and a Final Recipient for the purpose of financing an Eligible EE Investment (i) with a minimum maturity of 4 years and a maximum of 20 years and (ii) for minimum amount of 40,000 Euros and a maximum amount of 1,125,000 Euros. Notwithstanding the above, the EE Loan size could be (i) lower than the mentioned minimum threshold if agreed by EIB and (ii) above the maximum threshold, up to a maximum of EUR 5 million, if the EE investment financed by the relevant EE Loan takes place in a building	http://www.eib.org/attachments/documents/pf4ee_request_for_proposals_en.pdf http://www.eib.org/attachments/pf4ee_support_beneficiaries.pdf
Smart Finance for Smart Buildings initiative (SFSB)	Smart Finance for Smart Buildings initiative. The aim is to make investments in energy efficiency projects in residential buildings more attractive to private investors, through the intelligent use of EU grants as a guarantee. This new instrument, together with other EU policy initiatives for smart buildings, aims to unlock a total of EUR10bn in public and private funds between now and 2020 for energy efficiency projects. It is estimated that this could support up to 220,000 jobs, and help establish a renovation market for small businesses worth up to EUR 120bn. In addition, up to 3.2 million European families could be taken out of energy poverty.	https://ec.europa.eu/info/news/smart-finance-smart-buildings-investing-energy-efficiency-buildings-2018-feb-07_en

8.2 List of market initiatives

8.2.1 Retail

Name	Scope	Link
KFW (GERMANY)	Energy Efficiency financing programme for residential buildings	www.kfw.de/inlandsfoerderung/Privatpersonen/Bestandsimmobilie/
Social Housing finance Programme by Caisse des Dépôts et Consignation (FRANCE)	Energy Efficiency financing for social collective residential housing	https://www.prets.caissedesdepots.fr/eco-prest-logement-social-eco-prest.html
		https://www.prets.caissedesdepots.fr/pam.html
		Eco prest taux zéro questionnaire : http://enqueteur.dgaln.developpement-durable.gouv.fr/index.php?sid=92969
PAM <i>Prêt Avance Mutation</i> (FRANCE)	Residential Energy upgrades financing using reverse mortgage	https://www.cbanque.com/actu/53668/un-prest-avance-mutation-cree-par-la-loi-de-transition-energetique
TRIODOS MORTGAGE (SPAIN, BELGIUM, FRANCE, GERMANY)	Residential energy efficient mortgages	https://www.triodos.be/fr/particuliers/triodos-credit-habitation/simulateur
Eco-PTZ (FRANCE)	Energy retrofit financing for residential building (individual and collective, homeowner and tenants)	https://www2.sgfgas.fr/web/site-public/accueil?redirect=https%3A%2F%2Fwww2.sgfgas.fr%3A443%2Fstatistiques
		Certification forms for individual and Collective Landlords are available here:
		https://www.ecologique-solidaire.gouv.fr/eco-prest-taux-zero-eco-ptz



SEB (Sweden)	Green Mortgage for A and B rating residential buildings	https://sebgroup.com/press/news/green-mortgages-to-finance-green-housing
PTZ+ (France)	All residential home acquisition	Household may benefit from an additional loan amount if they choose to acquire a BBC building or undergo deep energy renovations upon certification via EPC (label A)
SEAI Deep Retrofit Pilot Programme 2018	Public funding for deep energy retrofit in the residential market with a special focus on energy poverty	https://www.seai.ie/grants/home-grants/deep-retrofit-programme/

8.2.2 Funding

Name	Scope	Link
BERLIN HYP GREEN PFANDBRIEFE	Green Covered Bond on commercial buildings	http://sustainabonds.com/wp-content/uploads/the_green_pfandbrief.pdf
MUNCHEN HYP	ESG Covered Bonds on Commercial buildings	https://www.muenchenerhyp.de/en/downloads/esg_pfandbrief/One-Pager_englisch.pdf
CAJA RUAL DE NAVARRA Sustainable Cédulas	Green Covered Bond (« Cédulas Hipotecarias ») on residential buildings	https://sustainabonds.com/crn-eu500m-sustainable-cedulas-debut-decent-after-bbva/ https://www.cajaruraldenavarra.com/cms/estatico/rvia/navarra/ruralvia/es/particulares/informacion_institucional/galeria_descargas/2017-Sustainability-Bond-Framework-CRN.pdf?exp=TRUE
Barclay's Green loan (UK)	senior unsecured green bond on Low Carbon residential buildings	https://www.climatebonds.net/standards/certification/barclays-plc



Sparbol (SpareBank1)	Green Covered Bond on residential Mortgages	https://spabol.sparebank1.no/2017/green-covered-bond-issuance
		https://spabol.sparebank1.no/uploads/20180614_Spabol_IP.pdf
SpareBank1 Boligkreditt	Green Covered Bond on residential Mortgages	https://spabol.sparebank1.no/green-bonds
DEUTSCHE HYPO Green Pfandbriefe	Green Covered Bond on commercial buildings	https://www.deutsche-hypo.de/en/sustainability/green-bond
OBVION – RABOBANK Green Storm RMBS	RMBS – Low Carbon Residential Buildings	https://www.climatebonds.net/standards/latest-certifications/obvion
OVG Real Estate & ABN AMRO	Green bond for green commercial buildings	https://www.climatebonds.net/files/files/oekom_ABN_AMRO%20OVG_pre-issuance-report%207%20Oct%202016.pdf http://ovgrealestate.com/news/2016/abn-amro-and-ovg-join-forces-for-sustainable-office-buildings
ABN AMRO	Green Bond - Low Carbon Residential and Commercial Buildings and energy upgrades	https://www.abnamro.com/en/investor-relations/debt-investors/green-bonds/xs1808739459.html https://www.climatebonds.net/files/files/ABN%20AMRO%20Green_Bond_Framework_4_April_2018.pdf
JERNHUSEN Green Bond	Green bond - Low Carbon commercial Buildings	https://www.sustainalytics.com/wp-content/uploads/2018/03/Jernhusen-Green-Bond-Framework-Second-Party-Opinion.pdf https://mb.cision.com/Public/6221/2470010/b1b1079aa99f0249.pdf
Green MTN Program (SWEDEN)	Green Bond - Green Commercial Buildings (Real-Estate Company)	https://www.climatebonds.net/files/reports/cbi-the-green-bond-market-in-the-nordics.pdf



New York State Housing Financing Agency – HFA (USA)	Green MBS on Residential buildings (New constructions)	https://www.climatebonds.net/files/files/NYSHFA%20Post-Issue%20report%202016%20Series%20H%202017%20Series%20A.PDF
KBC (BE)	Use of Proceeds Bonds on Residential Mortgages	https://www.climatebonds.net/standards/KBC
DNB BOLIGKREDITT (NO)	UoP Green Bond- Green Covered Bond on Residential buildings	https://www.climatebonds.net/standards/DNB-Boligkredit https://www.climatebonds.net/files/files/DNB%20Green%20Bond%20Presentation.pdf

8.3 Financial Reporting Templates

Source	Scope	Link
European Central Bank	Asset Backed Security Loan Level Reporting Template(s) (Residential Mortgage Backed Securities (RMBS)) & Commercial Mortgage Backed Securities (CMBS))	https://www.ecb.europa.eu/paym/coll/loanlevel/transmission/html/index.en.html
Bank of England	Eligible Collateral Templates (Residential & Commercial Loan Collateral)	https://www.bankofengland.co.uk/-/media/boe/files/markets/sterling-monetary-framework/level-c-loan-collateral.pdf?la=en&hash=5BBC84A63228D7B47FAC8DC22119609E6B4B9A8A https://www.bankofengland.co.uk/markets/eligible-collateral
European Banking Authority	Non-Performing Loan Transaction Templates (Resi/ CRE & Portfolio Screening Template)	http://www.eba.europa.eu/risk-analysis-and-data/eba-work-on-npls



8.4 SEAI Application tables

Dwelling Type	
No of Units	
Year of Construction	
Construction Type:	
Pre- Works BER No:	
Pre- Works BER Grade	
Pre- Works BER kWh/m ² /year	
Pre- Works Air Permeability Test m ³ /h/m ²	
Post Works BER Grade	
Post Works BER kWh/m ² /year	<i>Proposed Value that Applicant is committing to achieving</i>
Post Works Air Permeability Test m ³ /h/m ²	<i>Proposed Value that Applicant is committing to achieving</i>
Renewable Contribution kWh/m ² /year	<i>Proposed Value that Applicant is committing to achieving</i>
Floor Area of Dwelling Type (m ²)	<i>Proposed Thermal Equivalent that Applicant is committing to achieving</i>
Wall Area of Dwelling Type (m ²)	<i>Average value for this building type, excluding window and door area</i>



Cost of Supported Measures	-
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3.2: Summary of Energy Savings			
<i>Complete Project Summary and Sub Project Tabs.</i>			
Overview - Energy Savings		Value for Money	
Total No of Units	-	€/ kWh	VALUE
Total Area of Dwellings		In m ²	
Total Energy Credits for Project	-	kWh/ year	
Average Reduction in Energy		kWh/m ² / year	
Average Renewable Contribution	-	kWh/m ² / year	
% Energy Savings	0%		

Overview - Costs		
	€/ Unit	€
Funded Capital Costs		0
Domestic BER Costs		0
Pressurisation Test Costs		0
Project Management Costs		0



BER Consultancy Costs		0
1% Airtightness bonus		0
Eligible VAT Expenditure		Fraction of Eligible VAT
Total Costs		0
Overview - Funding		
	%	
Grant	0,0%	Fraction of Eligible VAT
Milestone Payment - Interim 1	25%	0
Milestone Payment - Interim 2	50%	0
Milestone Payment - End of Contract	15%	0
Post Occupancy Evaluation	10%	0

EeDaPP – Energy efficiency Data Protocol and Portal - is an initiative by the European Mortgage Federation - European Covered Bond Council (EMF-ECBC), Ca' Foscari University of Venice, CRIF S.p.A., European DataWarehouse GmbH, Hypoport BV, TXS GmbH and SAFE Goethe University Frankfurt. For more information, visit: www.energyefficientmortgages.eu



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