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Supportive financial constructions

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Introduction

Deep renovations towards nearly Zero Energy Buildings (nZEB) in the EU's residential sector are seriously lagging behind. As technological solutions are more than sufficiently available, the focus must be on removing non-technological barriers. The main barriers relate to fragmentation of the renovation offer, resulting in inefficient or only partial solutions. One way to solve this is the use of a 'one-stop-shop concept'. The REFURB project focusses on the complex interplay of barriers through coordinated process organization, innovation and optimization to improve this one-stop-shop concept.

The goal of work package 4 (WP4) of the REFURB project ("Constituting the Compelling Offer") is to provide renovation packages to building owners by developing an integrated approach which bridges the gap between the demand and supply side. The scope of this deliverable D4.3 ("Supportive Financial Constructions") is to investigate suitable financing constructions for those compelling offers within the REFURB countries.

The first part of this report analyses these financial constructions at national level. In a first step, each REFURB country has selected customer segments for which compelling offers are being designed. The status of the Energy Performance Certificates and its impact on the valuation of housing are then explored. Next, an overview of existing financial mechanisms for deep energy renovations as well as subsidies in the REFURB countries are presented. To conclude, financial challenges and recommendations for a future implementation are derived per country.

The second part of the report summarizes the findings for all REFURB countries. For two customer segments (single family homes and multiple family homes), an overview is given of the financial mechanisms and challenges. Additionally, recommendations to high-level policy-makers for the implementation of financing mechanisms towards a market uptake of nZEB renovations are outlined. These recommendations can be a source of inspiration to constitute the final compelling offer described in deliverable D4.4 ("Renovation packages"). Furthermore, the impact of the energy performance (as indicated on the EPC) on the real estate value of residential property is summarized for the countries. The report concludes with a description of innovative financing possibilities in other countries, in addition to the well-established financing schemes of the REFURB countries.

Finally, for a fruitful implementation of a financial mechanism, macroeconomic factors should be taken into account as well. These factors have been collected per country. An extensive overview is presented in

Summary of the countries

In the six REFURB countries, there are a number of financial stimuli to reward homeowners when they conduct nZEB renovation. This can be **coaching, grants and subsidies** for individual energy-efficiency related renovation measures of the building envelope or the technical installations. Another option is **tax stimuli** such as tax deduction for selected renovation measures (Denmark) or tax reduction on property (Belgium, Flanders) in case of achieving a certain energy efficiency level with the renovation.

7.1 MACRO-ECONOMIC TENDENCIES

Financial differences between the six REFURB countries are important in order to understand the economic challenges in each country, but also in order to assess which financing options can actually work in renovation packages in each of the countries. In Annex a number of economic data from OECD are listed. Below is a short summary of the most important differences between the six countries.

- **Income/GDP**: Eastern Europe has inconsistent income, lower income/GDP
- **Debt:** Homeowners in the Netherlands and Denmark have more debt than other countries, banks are willing to take risks (good loan conditions)
- **Interest rate**: The short-term interest rate is following the same guidelines from the European Central Bank. Slovenia has a higher interest rate than other countries
- **The employment rate:** Belgium has a rather low employment rate compared to other European countries
- **Savings:** Germany, Slovenia and the Netherlands have higher savings than the other countries

7.2 SINGLE FAMILY HOMES

Within this section the financial mechanisms, challenges and recommendations are summarized per customer segment.

7.2.1 Coaching, grants and support for single family homes

In Germany, the Netherlands, Belgium and Denmark the characteristics for coaching and grants supporting energy refurbishment in single family homes are listed in Box 8.1.

Box 8.1 Financial stimuli: coaching stimuli, grant and grants for single family homes in Denmark, the Netherlands, Belgium and Germany

Denmark: In 2017, there are active several training programs for energy coaches, two minor national one stop shop offers (Better Home, Better Housing). Several local energy network/local energy coaching offers as Project Zero (Soenderborg), Green Business Growth (6 cities). A total grant of 2-3% on the total energy renovation investment can be obtained through 2 sources.

1. Tax deduction on the man-hour cost for energy renovation
2. Selling the energy saving to an energy supply company.

The Netherlands: In 2017, Stroomversnelling is a large-scale scheme for coaching for zero energy renovations in the Municipality of Leeuwarden, which includes renovation plans/guarantee coaching for nZEB.

Belgium (Flanders): Subsidies for individual renovation measures, with bonuses when part of an integrated nZEB renovation; grants for “nZEB-coache service” (called the “neighbourhood grant” when they support a collective renovation process of minimum ten individual homeowners; and a property tax reduction for deep energy renovation.

Germany: Effective grants from KfW bank, up to € 30.000, energy renovation and up to € 4.000 for consultancy leading to an Energy Efficient house (ZUSHUSS 43 AND 431)

To summarize, Denmark counts with several training programs for energy coaches and energy check-ups, a

low grant and subsidy system, where the Netherlands and Belgium (Flanders) both have schemes for coaching and for zero energy renovations. Germany is characterized by a very organized and large grant for both energy renovations and consultancy.

Box 8.2 lists the loan opportunities for single family homes in Denmark, the Netherlands, Belgium and Germany.

Box 8.2 Loan opportunities for single family homes in Denmark, the Netherlands, Belgium and Germany

Denmark: Private loans, long mortgage loans with a low interest rate, >€ 20.000-100.000 (30 years and 1-2% interest rate), combined with 10-20 years bank loans < € 20.000 with 3-6% in interest rate. 5% self-financing

The Netherlands: Private loans with raised mortgage for energy performance guarantee, > 10 years, € 27.000-34.000, 1-2% lower than the standard, 5 % interest rate. Energy saving loan, up to € 25.000, 15 years, 2,8 % interest rate. Property linked loan/ ESCO model. The investments are paid by energy savings. Leasehold/service costs loans linked to private housing association (Assen). Public loans in the Municipality of Leeuwarden. For homes with a value of less than € 250.000, energy saving loans up to € 7.500

Belgium (Flanders): Specific examples of soft loans: private renovation loan for House Owner Associations, Antwerp, 2016 (lower interest rates than for private homeowners). Specific example of revolving funds: Community Land Trust tool, (loan to low-income households (paid back when sold), Ghent, 2015. Duwolim Plus, the renewed Renovation loan from the Province of Limburg

Germany: Private special bank loan for renovation or modernisation, 1-2%. Big public KfW-scheme for loans up to € 100.000 (1-2% kfW-loan; 0,75%, repayment grant). The 'Effizienzhaus'-standard after refurbishment, defines the repayment grant back (5-15%) Kredit 1667, up to € 50.000 for heating systems, 10 years, 1,11% interest rate .

To summarize, Germany stands out with a very effective grant, subsidy and loan system, where the conditions are far better than in the other countries and where the results are very positive (230,000 dwellings, 514,000 tons CO_2 saved, energy saving € 155 M/year). However, it is recommended that the conditions for achieving a certain energy standard should be lower in order to attract more homeowners to the program. Denmark´s characteristics are long private 30 years mortgage loans and a very low interest rate. The Netherlands and Belgium both have a number of private and public 10-20 years loans supporting energy renovation.

7.2.2 Financial challenges for single family homes

The financial challenges are very different in the four countries. They are summarized in Table 12.

Table 12 Financial challenges in Denmark, Belgium, Germany and The Netherlands for single family homes

Country	Challenges
Denmark	1. The valuation of houses are not updated by law and does not include the energy standard 2. Attractive packages of energy renovation offers for the end customer are missing 3. The finance sector is not given authority to require professional energy checks- up as a condition for an energy loan and have too little knowledge about the advantages of

	energy renovation 4. The subsidies and fiscal instruments are very low and limited
Belgium (Flanders)	1. The need for pre-financing: Renovations up to nZEB level require a high upfront investment. 2. Orienting the energy renovation investments, with sufficient attention for other housing aspects such as living quality 3. The need for financial resources for unburdening and counselling of dwellers for the preparation and implementation of energy saving investments 4. A higher deployment of fiscal instruments to stimulate energy saving investments
Germany	1. House owners often decide against deep renovation and go for single measures or a stepwise approach 2. EPC ('Energieausweis') needs further improvements to be trusted 3. Technical potentials and funding need to be tapped in practice 4. Transparency is the first step towards taking action 5. The customer's needs should be paramount and in focus
The Netherlands	1. Loan to value is a still a relatively new type of arrangement to stimulate nZEB renovation. 2. There is a level of uncertainty whether the theoretical estimation of the amount of energy saved due to nZEB renovation will actually be reached in practice. 3. The payback period for nZEB renovation is still very long. 4. The amount of money that needs to be invested for nZEB renovation to be carried out to full extent is considerable. 5. Financial institutions are hesitant to provide loans for nZEB renovation for individual homeowners as they consider this to be a high risk financial product

To summarize, existing fiscal regulations and subsidies seem not to be sufficient and ambitious enough to really convince homeowners to renovate their home to nZEB-level. nZEB renovations should be de-risked to stimulate investments from banks and financing institutions. Banks and financial institutions neither offer pre-financing nor cooperation with the energy advisers on a long term energy renovation plan. The amount of money to be invested is considerable. The EPC needs further improvements to be trusted and therefore the full effect of EPC is still not seen. The regulation for valuation of houses is not updated and does not include energy improvements. There is a lack of attractive and transparent packages solutions where health, comfort esthetic and the costumers needs are in focus.

Based on these challenges each country has national recommendations.

7.2.3 Financial recommendations for nZEB renovation in single family homes

Fiscal regulations and subsidies

If nZEB shall be reached, there is a need for much stronger fiscal regulations and subsidies like the one seen in Germany by the public bank, kfW. There good loans with low interest rate and grants can be provided, if documented that a certain energy standard is achieved. However, it is recommended to regulate the conditions since there is a need for both implementing energy savings related to the easily achieved low hanging fruit and the more costly nZEB renovation

Furthermore, in Denmark, because of low energy prices, there is a decreasing interest for energy renovation that is not seen in the other countries. There is a need for more focus on implementing some of

the many recommendations in the Danish energy renovation strategy plan to achieve the EU recommended nZEB standard.

This can be tax deduction on property, as seen in Flanders, where home homeowners are rewarded for achieving planned energy renovation. On the long term, it is recommended that housing taxation should be based on energy performance and living quality (possibly along with other criteria).

Financial construction of packages with focus on health, comfort, esthetic

Financial unburdening of the homeowner, giving them an overview of the possibilities, are recommendations especially for the Netherlands and Belgium; a point to consider, when composing the renovation packages within REFURB. Especially more incentives for young families are needed since they are challenged the most when buying a house. The development of new business models for innovative support mechanisms, such as guarantee funds, Energy Performance Contracting, renovation cooperatives, crowdfunding initiatives should be considered.

The subject of finance cannot be seen as a 'stand-alone solution'. Clearly quality assurance has to be provided from the building industry and the homeowners need to have access to affordable financing and quality guarantees.

Loans and mortgages

There is a need for bank/mortgage loans combining cheap energy loans on the condition of energy consultancy or standards. Furthermore, this technical support can be an integrated part of the financing scheme. For instance, energy audits as a prerequisite to benefit from financial loans or the technical support funded through the financial program.

It should be allowed for the bank adviser to set conditions such as an energy check-up, to secure that the loans granted are well invested and that energy savings are prioritized.

More effect of EPC and regulation of valuation of houses

Surveys among real estate agents strongly indicate that the EPC can be improved to further stimulate its effect on house pricing. Improvements can relate to making the EPC and the expected benefits more visually understandable, providing cost information of renovation measures and expected energy savings and showing the relation between the simulated energy score and the actual energy consumption.

Also a common standard for value estimation of houses including energy performance is a central element that could push the market and the demand for nZEB renovations. There is a need for an update on the regulations about value estimation of houses reflecting the energy standard.

7.3 MULTIFAMILY HOUSES

7.3.1 Coaching, grants and support

Box 8.3 lists the coaching, grant and support initiatives in Estonia and Slovenia for multifamily houses

Box 7.3 Coaching, grant and support stimuli for multifamily houses in Estonia and Slovenia

Estonia: On national level 'En Svet General Consultancy' organizes offers free consultancy for the inhabitants Apartment associations who could rely on KredEx for technical assistance as well as help with energy audit grants, or guarantees covering up to 35% of their renovation costs, 2016. The program will

end in 2020.

Small residential buildings can receive up to 30% of the total cost of reconstruction with the maximum grant amount at € 15.000.

Slovenia: Eco Fund: 20-30% of the total investment can be obtained by subsidies for renovation (subsidy for both private persons and mangers of blocks).

To summarize, Estonia and Slovenia offer grant possibilities (25-35%) which are not seen in any of the other REFURB countries. However it is likely that the grant system will not continue after 2020. In Estonia, more than 500 multifamily houses with 1,4 million m² were renovated as a result of the Kredex program for energy renovation. In Slovenia, approximately 62.500 investments in buildings, worth a total of € 488 million were approved for households in the period 2008 to 2013.

Box 7.4 Loan systems supporting energy renovation in multifamily houses in Estonia and Slovenia

Estonia: Private mortgage loan: 80%, over € 7.000, grace period. Private renovation loan: 20 years, Euribor rate, normally 3%, together with applying for grant. Public KredEx loan: For building associations, 75% of the amount, 1,2-1,7%

Slovenia: Eco fund loans: favorable loans for energy renovation and heat pumps. Repayed within 10 years (interest rate EURIBOR + 1,3% fix surcharge).

To summarize, Estonia and Slovenia are characterized by private loans no longer than 10-20 years, but attractive public loans (KredEx loans and Eco fund loans) with low interest rate.

7.3.2 Financial challenges for multifamily family houses

The countries have highlighted 4-5 mayor financial challenges that are barriers to get a real demand for nZEB energy renovation related to multifamily houses. An overview is shown in

Table 13.

Table 13 Financial challenges for multifamily houses in Estonia and Slovenia

Country	Challenges
Estonia	**1.** Ability (or lack) of Housing associations to apply the loan for renovation and to service it. **2**. Exhaustion of subsidies. The funds for current renovation subsidies were calculated to last up to 2020. **3**. The lack of initiative from the housing associations
Slovenia	1. EPC obligation for all buildings are missing. 2. EN svet consulting – need to be significantly improved – more in deep consulting and support 3. The regional support system is not sufficient, it needs to be established in counseling 4. Bank loans are too expensive and too short termed

To summarize, Estonia and Slovenia have agreed that subsides, advice and lack of fiscal regulations are the biggest financial challenges for nZEB refurbishment in multifamily houses.

Subsidies: The large scale EU- financial programs for supporting energy renovation might disappear in 2020.

Knowhow/advice: The housing association shall be able to apply for the loan and service it. Energy advising in multifamily houses can be a challenge, because the multifamily houses consist of private apartment owners and there need to be a majority voting for action to implement energy renovation.

Lack of fiscal regulations: More regulations are needed to stimulate nZEB renovation because of low income of the inhabitants and a careful bank sector. The housing associations lack initiative and poor financial discipline affects qualifying for collateral. There is a need for banks to take more risks and provide long term loans and low interest rate, if reaching for nZEB renovation.

7.3.3 Financial recommendations for nZEB renovation in multifamily houses

The two countries have different national recommendations for the future. However they can agree on the following recommendations:

Subsidies, keep the well-functing EU-programs

KredEx (Estonia) and national Eco fond (Slovenia) with 25-35% subsidy

Different scenarios can be set up for implementing energy renovation. As for the future –there is no other plan or proposal than keep using the KredEx program and the Eco fund program, as long as there are financing possibilities. These programs have neither been negotiated nor adopted by the parliament. The subsidy program is not a financial measure but foremost social. All financial and conditions are not negotiable.

Further develop and support local energy advice programs

The regional support system needs to be established in counseling (including empowerment of owners of flats, education of the contractors and consulting). Local communities need to continue with supporting energy measures. It is recommended to further develop energy advising ex. “En Svet General Consultancy” in Slovenia, so that they can offer a good guidance for step by step nZEB renovation.

Further develop fiscal regulations

It is recommended to implement national tax reductions for owners of buildings for the implementation of energy efficiency measures. That would be beneficial for the state – better housing stock (less CO_2 emissions) and for the building market. Regulation from the government are needed to empower more financial discipline.

Provide attractive loans

If regions would have higher economic growth and banks would become less restrictive, with favorable loans from banks and higher income of the inhabitants more people would decide for deep renovation. Therefore, a suggestion is made that ECO fund and KredEX to try to work with banks on a long-term system in which banks would demands less insurance and lower interest rates for loans.

7.4 ENERGY PERFORMANCE CERTIFICATES (EPC) AND REAL ESTATE VALUE

Table 15 presents an overview of the impact of the energy performance (as indicated on EPC) on the real estate value of residential property.

Table 14: Overview of EPC effect on prices and value securing

Country	*EPC effect on price level*
Denmark	€ **7.000 extra value** of the single family house for **each step up the EPC ranking**. G label homes had a € **21.000 lower value compared to an average D label home.**
Belgium (Flanders)	A national study indicated a decrease of 0.75% of the selling price of a single family house in case the energy-score increased with 10%. A European study of the Flemish building stock showed that an improvement of 100 kWh/m² in the energy score corresponds with a 4.3% higher price, on average, while an improvement of 100 kWh/m² in the energy score is associated with a 3.2% higher rent
Germany	**Not yet existent**
The Netherlands	**G label homes were € 16.000 less in value than average**, An A label home has a higher value of € 6.000, compared to an average EPC label
Estonia	**Not yet** publicly acknowledged. Calculations estimate the prices to be 5-15% higher
Slovenia	**Too soon** to see an effect, EPC in 2015. Calculations show sale prices up to 22% higher

To summarize the table shows that Denmark and the Netherlands both seem to have significant impact of the energy efficiency on house prices as G label homes were € 16.000 – 21.000 less valued than an average D-labelled house. In Flanders there is also 3.2-4.3% higher rent/price for a good energy labeling, where the effect is still not seen in Germany, Estonia and Slovenia.

8 Innovative financial schemes in other countries

There are already a number of innovative financing schemes, which are piloted in certain Member States in Europe. An overview of innovative financing schemes is provided in Table 15**Error! Reference source not found.**.

The challenge is to identify the financial constructions with the largest potential, more in particular to which extent they could be integrated in the renovation packages that will be developed within REFURB.

Table 15: Overview of innovative financial schemes (source: [CoM, 2014])

Scheme	Brief description
Energy Performance Contracting (EPCo) with third party investment	EPCo is a contractual arrangement between a beneficiary and an Energy Service Company (ESCO) about energy efficiency improvements or renewables installations. Normally an ESCO implements the measures and offers the know-how and monitoring during the whole term of the contract. Essentially the ESCO will not receive its payment unless the project delivers energy savings/production as expected
Revolving loan funds	A revolving loan fund is a source of money from which loans are made for multiple sustainable energy projects. Revolving funds can provide loans for projects that do not have access to other types of loans from financial institutions, or can provide loans at a below-market rate of interest (soft loans).
Soft loans	Soft loan schemes are loans with below market rates and longer payback periods
Loan guarantees	Loan guarantees provide buffers by first losses of non-payment
Portfolio guarantees	Portfolio guarantees reduces the risks of payment delays, so reduces the overall costs of financing (solid protection from later payments).
On-bill financing	Energy suppliers collect the repayment of a loan through energy bills. It leverages the relationship, which exists between a utility and its customer in order to facilitate access to funding for sustainable energy investments
Crowd-funding / community funding	Pooling resources of different actors, utilizing most of the time an internet-based platform. This can happen in combination with energy cooperatives.
Green Municipal Bonds	Local government (or their agencies) can issue green bonds to fund their sustainable energy projects. A green bond can operate as a normal bond, which is a debt that will be paid back, depending on the characteristics of the bond, with interest. These can be made attractive via tax-exemptions.

A good example of how this could look like in practice is the implementation of the Pass Rénovation, which is applied in the Picardie region in France. This best practice can serve as inspiration to empower and finance nZEB renovation. The program makes use of the ELENA fund from the European Investment Bank (see Box 9.1).

Box 9.1 Picardie and Elena fund funded by the European investment Bank

Pass Rénovation Picardie

ELENA ("European Local ENergy Assistance") is there to support EU municipalities and regions when lack the necessary technical expertise and organizational capacity to implement large energy efficiency and renewable projects, such as regional housing renovation programs. The challenge of such projects is to provide value for money and to secure funding. The ELENA-fund is run by the EIB (European Investment Bank) and it is funded through the European Commission's Horizon 2020 program.

ELENA covers up to 90% of the technical support/adviser cost needed to prepare the investment program for implementation and financing. ELENA helps local authorities to get their projects on the right track and make them bankable, whether it is for retrofitting or integrating renewable energy in public and private buildings, energy-efficient district heating and cooling networks or innovative, sustainable and environmentally-friendly transport systems.

The French region "Picardie" has an ELENA-project, for the Renovation program "Pass Rénovation Picardie". The ambition is to renovate 10.000 dwellings per year, amongst which 3.000 collective renovations. The focus of the program is on deep renovations (at least 3 renovation measures).

Picardie Pass provides own loans, and loans from the European Investment Bank through the Elena-facility. The goal is to realize 100 million of investments on the field. Loans are provided to homeowners for 2%. The targeted segment are dwellings constructed before 1982, ideally with energy bill of € 240 per month (which corresponds with € 2.880 per year). On an average, € 40.000 per household is borrowed. Half of the money must be refunded through energy saving in a period of 25 years. The goal is to reduce the homeowner energy bill with 40%

Pass Rénovation Picardie has set-up a kind of a "public service", a special legal entity to provide the loans. The system needs 1.000 loans per year to be cost-efficient. 23 renovation coaches guide the homeowners. The homeowner pays € 1.800 for the guidance. The guidance is obligatory for getting the loan. The amount of € 1.800 is a fixed price, also for smaller works, but it is lower than the real cost/price. It can be paid in steps, or per month. It includes: The composition of a personal renovation plan, support in selection and follow-up of contractors (approximately 60 hours per case spent on coaching). From the people that initially showed interest via phone contact, more or less half of them were visited by renovation coaches, with in the end approximately 25% finally deciding to continue with a renovation. The goal is to reduce energy costs with 40%. This is monitored through energy bills and energy consumption (in-depth financial analysis). This target is achieved for the majority of the cases, nevertheless in some cases energy costs are reported to by increased after the renovation.

[PASS, 2016]

Annex: General macroeconomic factors of the six REFURB countries.

1 Denmark

In general Denmark is characterized by good financing opportunities for private homeowners. The Danish mortgage system for private owned houses is designed to give house owners access to both flexible and competitive financing for both the purchase and energy renovation and refurbishment of private houses.

Up to 80% of the value of the house can always be financed without any other security than the house itself and on long-term basis at an attractive interest rate.

This type of financing is of course not unique to Denmark, but since it is widespread in Denmark – with many owners – and with the use of bonds as a way of financing; the system is usually considered solid and stable. Especially since the financial crisis, Danish house owners benefitted from investors' trust in the Danish system, hence reducing interest rates to a very low level.

1.1 SELECTED SEGMENT

There are 1.216.000 private owned single family houses in Denmark. The average size of a Danish single family house is approximately 150 m² with a tendency of building bigger, so that the average size of a newly build house is 203 m².

New houses are obliged to live up to a very high energy standard. In the building regulation from 2015 (BR15) the requirement for a low energy house at 150 m² is max 36,7 kWh/m²/year (Energitjenesten, 2015)[1]. In the number is included the dwellers' use of energy for heating purposes but not the dwellers' use of energy for electricity purposes. Because of the energy requirements new houses are constructed with new energy efficient materials in insulation, windows and doors and often with – at least partly – heating from new energy renewable sources like solar panels or geothermal heating.

However, as per the beginning of 2016, out of the 1.216.000 houses 90% or almost 1.100.000 houses are constructed before 1986.

Table 1 Number of young families and empty nesters in the single family houses constructed 1960-1980

	Single family houses	Target group of	
Construction period	Number	Young families	Empty nesters
Selected period 1960-1980	489.316	54.000	135.000
Total single family homes	1.216.000	190.000	

These 30+ year old houses have a high-energy saving potential. (Witchen, SBI, 2009) [2].

In Denmark, the selected segments are "Empty nesters" and "Young families" living in single-family houses built between 1960-1980 in the outskirts of the big cities. In the WP2.2 report the argumentation for choosing these two segment is listed. In 1960-1980, many single-family houses were quickly built with very

[1] https://www.energitjenesten.dk/lavenergi-klasse-2015.html
[2] SBI, 2009, Witchen

little attention to energy efficiency. From statistics, 40% of all single-family houses, 489.316 houses, were constructed in the period 1960-1980.

"Empty nesters" are families with only the parents living in the house. The children left their home leaving the parents with often quite large houses but also in a situation where they can still manage to take care of the house and still have a job etc. This means that they are not interested in moving from the house. Characteristics of this group are a good income, a saving and that the value of the house exceeds the debt, leaving them with good opportunities of financing improvements.

"Young families" have, in most cases, recently bought their first house. They do not have much saving and not much extra value in the house. However they usually have a good income and the household income will increase during the coming years when they establish themselves at their jobs. The financial institutions know this and consider this as a solid group of customers with rising possibilities and many years to pay back on an investment.

Both groups could be interested in energy renovation because of the focus on things as comfort, convenience, better indoor climate and lower costs in the future.

For the "Empty nesters" it is the preparation for becoming older and the possibility to remain in the house when getting older that can give the incitement to invest in easier heating system or a better indoor comfort, but also a focus on the future cost of energy and maintenance of the house when the "Empty nesters" leave the job and rely on their pension.

For "Young families" convenience and climate is of importance. A young family does not have much time so convenience in climate control can be of interest, especially maybe in combination with new technology and of course also with the focus of providing a healthy indoor climate for the children to grow up.

There is of course some uncertainty when trying to find numbers for such segments, but based on statistical figures, the number of "Young families" in houses build from 1960-1980 is approximately 54.000 whereas the number of "Empty nesters" is approximately 135.000.

A best estimate is then that a total of approximately 190.000 Danish houses/families will be the interesting segment for deep energy renovation.

1.2 VALUATION AND VALUE SECURING OF HOUSES

One major factor in all aspects of financing is the valuation and the estimated energy savings that can pay a part of the refurbishment. In the general description of the Danish bond based mortgage system the valuation of a house was described as being the key factor for the financing possibilities.

The bond issuers are underlined certain restrictions in the way that they make the valuation of improvements made on a house and this system might need a revision to make it more up to date and maybe add higher value to energy renovated houses.

When setting a price on a house, that has been refurbished, it is a challenge, that the costs of energy improvements does not match the assessment of the real estate dealers. This means that the house owner in praxis cannot finance the full 80% of the improvements. In Denmark, the valuation of houses is regulated by a law from 1958. Improvements in order of energy refurbishment is not a part of the valuation system. To create motivation for deep energy renovation it can mean a huge difference, if the policy makers changed this regulation, so that energy renovated houses can be valuated higher than today.

However, after the financial crisis, this is a very political topic and in recent years and has until now been considered too fragile to change the valuation system of houses.

One thing that has been done is to make energy use in houses more visible is however the Energy Performance Certificate.

1.3 ENERGY PERFORMANCE CERTIFICATE (QUALITY ASSURANCE)

In Denmark, energy labeling or an Energy Performance Certificate (EPC) has been statutory since 2011 when selling and letting buildings. The requirement says a new EPC every seven or ten years for large buildings. The EPC of buildings serves two purposes:

- The EPC should make the energy consumption of the building visible and thereby function as informative labeling when the building is sold or let.

- The EPC should give an overview of which energy-related improvements will be cost-effective to implement: their objective, implementation costs, and the savings to be made on electricity and heating bills.

EPC is carried out by an energy consultant, who registers the building and investigates the quality of insulation, windows and doors, heating installations etc. Based on this, the energy consumption of the building is calculated in accordance with standard conditions for weather, household size, operation hours, habits of consumption etc.

The calculated consumption is an indicator for the energy-related quality of a building under present conditions; opposed to this is the actual consumption, which is highly influenced by both the weather and the habits of the users of the building. Some people save on heating while others boost up the heating with the windows open. Some families have teenagers living at home who use large quantities of hot water. The EPC shows the quality of the building compared to other buildings, not how it is used or whether the winter was cold or mild. The scale of the label spans from A to G and corresponds to the numbers known from energy-using products, e.g. domestic appliances. The scale is shown in **Figure 1**.

Figure 1: Scale used for the Danish Energy Performance Certificate. *(Energistyrelsen, n.d.)*

Including in the calculation of the energy demand for Danish domestic buildings are the building's total energy demand for heating, ventilation, cooling and domestic hot water per m² heated floor area (gross area). The limit values for the energy label are shown in Table 2.

Table 2: Allowed energy demand for the Energy Performance Certificate. A=gross area. Result is in kWh/m² per year. (Energistyrelsen, n.d.)

A2020	A2015	A2010	B	C	D	E	F	G
20	≤ 30 + 1000/A	≤ 52,5 + 1650/A	≤ 70 + 2200/A	≤ 110 + 3200/A	≤ 150 + 4200/A	≤ 190 + 5200/A	≤ 240 + 6500/A	> 240 + 6500/A

Dwellings, public buildings and buildings for commerce and service are all covered by the regulations on EPC. The Energy Performance Certificate has been a great success on the public awareness on energy use and behavior. The system has had that effect that houses with a good energy label are much easier to sell. A recent analysis from the Danish Energy Agency also shows a clear tendency on how houses with a high energy standard systematically leads to higher sales prices, with the energy labeling as the most important parameter. An example for this is that one step on the EPC scale has same value as 10-15 extra m^2. (Energistyrelsen, 2015)

30% of all single-family houses have an energy label. The number of energy labels in multi-storey houses is 72%. Only 30% of the total building stock has an energy label.

The EPC can be a driver for economic reasons, since the label clearly increases the price for selling the house. When it comes to initiating renovation projects, the EPC will suggest different initiatives combined with prices and ROI, which make it clear for the homeowner where to start. However, it is the opinion of the authors, that the EPC will be most effective for deep renovations when it is combined with the professional advices from architects, engineers or Better Houses Consultants. The quality of the EPC has also been questioned due to an investigation from 2014, where errors were found in every 8^{th} certificate. Therefore, the energy consulting companies can now be put in quarantine, if mistakes are found in the reports (Gram-Hanssen et al., 2015).

The correlation between Energy Performance and sales price
A better energy label, which may have an impact on the selling price of a house. The Danish housing owner association Bolius writes on their website, that the average increase in the selling price is around 500 kr. Per. square meter (€ 67/m²) or € 7.000 for a 100 m^2 house, but it varies depending on the level of energy improvements in the house. (Bolius, 2016).

On behalf of the Danish Energy Agency Copenhagen Economic has examined the extent to which an improved energy standard. The analyze is based statistical analyzes based on 365,000 sales.
Sales of single-family homes in Denmark from 2006 to 2014 and detailed information on the house energy standard, construction, general condition and location, sales situation and vendor characteristics. (Energystyrelsen, 18. Nov. 2015).

The analyze shows that there is a clear correlation between high energy standard and higher selling price The results show that the housing with high energy standard systematically leads to higher selling prices, regardless of how many other residential and sales characteristics is taking into consideration**. Estimates point to a power between 40.000-55,000 kroner (approximately € 7000) per step up the scale of an average house of 100 m². This result is in balance with Bolius, 2016.**

The analyze indicates that home buyers are very aware of the importance of future energy costs when buying a house. The analyze of the 365,000 sales also conclude:
The Energy Standard is not fully reflected in the sales price. However, results in a higher energy standard is not as big an effect on the sales price, as the energy costs saved over time should dictate. We find that the effect of better energy standard is about 35-50 percent lower than the theoretical calculation. This corresponds to about **50-65 percent of the theoretical savings through a high energy trapped in the standard housing prices.** There may be several reasons for this:

- Housing with bad energy label has the potential to make energy renovations. A buyer will not pay more for a home with high energy standard than it costs to buy and renovate energy equivalent housing low energy standard.

- The value is this 'option' promises the price of a house with bad Energy rating relative to a housing with a good energy label (which, therefore, do not have this option).

- If energy prices are expected to fall, a home with good energy label is becoming relatively less attractive. Uncertainty about energy price developments may therefore reduce the willingness to pay for high-energy standard. If home buyers are not fully informed about the value of high-energy standard, they will not pay for it.

- Homebuyers may have limitations of credit nature. If the buyer has not to borrow extra for a similar house with high energy standard despite lower running costs over time, they will not be able to value and price the energy standard.

- Conversely, homes with high energy standards have a better climate in the form of, for example, reduced drag and thermal bridges, which suggests a greater willingness to pay for housing with good energy standard.

In the analyze, it has been concluded that if the buyers give information about the connection between a good energy standard and economic savings, it will also be possible to sell the house to a higher price. Secondly, it is found, that the greatest correlation between price and energy standard housing built in the period 1931-1960. There is a clear tendency that the effect of energy is lower for newer homes, which generally have a higher energy label. This applies to homes built after 1972 and especially after 1998. Third, the effect of the energy standard also depends on factors such the actual buyer's income, the property sales price and location. It is quite interesting, that high energy standard and housing price is about 40 percent higher when the buyer is a high-income family. This may be due to high income typically have easier to obtain financing, and thus more able to pay a higher upfront amount (Energistyrelsen, nov. 2015)

1.4 EXISTING FINANCING SCHEMES

Mortgage bond loan systems

The Danish mortgage system is based on the issue of bonds for the value of up to 80% of the property (80% for private houses, but only 60% for buildings for commercial use).

Even though it would be theoretical possible to finance 80% of the value of any property by the mortgage bond system, the financial adviser also carry out assessment of the house buyer’s possibilities to pay back the loan based on the house buyer´s income. There are no exact rules for this, but in general, there is a limit of the loan amount at approximately 3 times the house buyer’s income plus the house buyer´s own equity.

Within the system there is also a variety of different types of loans. The basic variation is the choice between a fixed interest for the whole period of repayment or only for a shorter period, where after the interest rate shall again be calculated based on the market value of the bonds.

In general – that goes for loans with both variable and fixed interest – the maturity of bonds issued is between 10 and 30 years; i.e. 10 years, 15 years, 20 years and 30 years.

Mortgage bond loan with variable interest rate
Mortgage loan with variable interest rates have typical a repayment period of 30 years (which at the present is the longest possible repayment period possible), but the interest rate is only fixed for a shorter period. After the fixed binding period, the interest rate will be fixed again, based on an auction of the

bonds, where investors make a bid on the interest. The period of fixed interest is at the present either 1 year, 3 years, or 5 years. The shorter the binding period, the higher the interest rate.

Mortgage bond loan with fixed interest rate
Mortgage loans are fixed for the whole repayment period at time frames (10, 15, 20 or 30 years). The interest rates vary depending on the length of the repayment period.

The lender (bond issuer) has the possibility to buy back the bonds and hence paying back the debt before the repayment period is over. This is usually done for refinancing, if the interest rate changes.

The mortgage loan based system works so that when the interest rate goes up the price of the bond goes down. The house owner can reduce the debt in the house by refinancing with new loan with a higher interest rate. In total this can reduce the payments or just adjust the debt so that it better fits the value of the house.

Mortgage bond loan with no repayments – installment loan
As a special type of loan the Danish house owner has the possibility in a maximum period of 10 years to change to installment loan, where the house owner only pay the interest rate of the loan and not the repayment. The cost of having an installment loan in a period is typical a lower price of the bonds when selling bonds for financing and/or a higher interest rate.

Financing for above 80% of the house value
Whereas the financing for up to 80% of the house value is always done by bonds, the house owner must cover the remaining 20% with other sources of financing.

Today a new house owner typically needs to finance up with 5% in cash. However, these 5% can in many cases be financed through a personal loan.

With security in the house the remaining 15% is typical financed by a bank loan. However, the security is listed after the bonds for the first 80% making it much more expensive to finance this part. The interest rate is higher and the repayment period is shorter (usually max. 10 years).

However, the start-up cost of a bank loan is much lower, and banks are often more flexible on the estimate of the added value, when it comes to renovations. Bank loans is therefore often used for smaller renovations and modernizations.

In general, financing by the mortgage system is only cost efficient for loans above approximately € 13,000, whereas bank financing is more cost efficient for financing of modernizations/renovations below this amount.

Even though the bond financing is both a secure and low priced financing, it has the downside that the startup cost is quite high, due to payments of establishment costs and public notarization of the loan.

The system is very flexible since the bond issuers most of the times accept the purchase price of the house as the value of the house except houses in rural areas in the province of Denmark. A house constructed in the period 1960-1980 can as an example be sold for a factor 20 more in the capital of Denmark than in the outskirts of Denmark (vest, north and south).

1.5 EXISTING SUBSIDIES FOR ENERGY RENOVATIONS

There are two overall ways for a private house owner in Denmark to get subsidies for renovation/ modernization of a house. Advantages and disadvantages are included in the description of the subsidies.

1. The first one is the special "bolig-job ordning" which can be translated to "Housing Job Scheme". The homeowner can get a reduction at the tax-bill. The concept is popularly called the "craftsmen deduction". It is possible from 2016 to subtract up to € 1.500 per year per person over 18 years in a house (or an apartment for that matter) a reduction in tax for money spent on for man hour cost for either energy renovation/green project or energy advice that can lead to energy optimization. The tax value is approximately 33%. For 2014-2015 it was not possible to subtract for energy advices. This new possibility with subsidy to energy advices can hopefully lead to a bigger demand for energy advising.

2.The second one is a direct subsidy for improvements on the house, that reduces use of energy. The system is handled by the energy utilities, the homeowner can sell their energy savings to an energy supply company offering, € 0,08per kWh saved. The homeowner needs to apply for the subsidy before carrying out the renovation project. After carrying out the project invoices are send to the energy supply company and a subsidy, typically from € 100-2.000 will be send to the homeowner, but is based on standard values for different improvement and not on specific measurement on the actual energy saving. For selling energy savings a standard protocol for theoretic energy savings is used, e.g., when changing from a low quality window to an energy window . The Better Houses Adviser/Energy craftsmen/construction company often help the homeowner and apply for the subsidy on behalf of the homeowner, so the homeowner has less work. The subsidy can pay for energy advising or a Better House Plan, but not many local authorities and stakeholders use this argument. About 50% of the Danish inhabitants know about this possibility.

When selling energy savings there is also a comprehensive catalogue of improvements that a house owner can obtain subsidies for:

First there is the conversion of energy source. Conversion from oil to central district heating, geothermal heating or air/water heat pump is one option, but also the conversion from gas boiler to the same alternative sources or the conversion from electric heating to either geothermal or air/water heat pump can be subsidized. Air heat pumps as a supplement to existing heating can also be subsidized.

Another area is insulation. Both insulation of walls, roof, flor and pipes.

The change of windows and doors to more energy efficient models are also a possibility and the same goes for solar panels, ventilation, electrical water heaters and even light bulbs.

In the Danish system of subsidies for better energy efficiency in houses there is a lot of possibilities and a fairly simple way of getting the subsidies since it is based on the use of standard values hence there is no control and no measurements of the actual savings.

The downside of this is however that the subsidies are very low. For the change of a door, it can maybe be approximately € 30 so the subsidies do not give incitement to make the investments, but only a small bonus when the decision is already made.

3. Besides these two schemes for house owners the local municipalities (for cities with more than 30.000 inhabitants) have the possibility to fund initiatives through a "city development" fund. This financing can be used for the improvements and energy savings in houses/apartments in specific development areas.

Besides, some of the test municipalities have been given a subsidy to an energy check-up and a Better Houses Plan. For example, Favrskov Municipality offers 200 Better Houses Plans from oct.2014-mar. 2016 for free to the home owners of the municipality to support the initiative and create job. They had an agreement with the Energy Supply Company AURA and pay 350.000 DKK (€ 50.000) per year, € 500per Better Houses Plan.

In 2014/2015 104 Better House Plans were carried out. They result in 29 renovation projects, which is a success rate of 35%. The average investment in energy renovation per house was € 10.000 (73.000 DKK). 30% of the refurbishments were carried out by craftsmen and 70% by the homeowners themselves. It is expected, that the 104 homeowners will carry out further investments for energy renovation at up to € 4000 (30.000 DKK) per house.

The municipality of Høje Taastrup is another example, where the municipality expect to pay (January 2016) for Better Houses Plans and renovation project at 50 homeowners. The homeowners had to commit to a renovation project for a total sum of 9 mio. DKK (€ 1,2 M) The municipality supported the 50 project with 25% of the total investment sum.

The average sum of investments was € 24.000 per house (DKK 180.000), where the subsidy per house was € 6.000.". It is possible from 2016 to subtract up to € 1.500 per person every year for man hour cost for either energy renovation/green project or energy advice that can lead to energy optimization. For 2014-2015 it was not possible to subtract for energy advices.

1.6 CHALLENGES AND RECOMMENDATIONS FOR DENMARK

1.6.1 Danish challenges according to experts

In general Denmark is characterized by good financing opportunities for private homeowners. The Danish mortgage system for private owned house is designed to give house owners access to both flexible and competitive financing for both the purchase and energy renovation and refurbishment of private houses.

Especially since the financial crisis, Danish house owners benefitted from investors' trust in the Danish system, hence reducing interest rates to a very low level.

In the preparation of this report a workshop of experts in housing economy and energy savings, (real estate dealers, bank advisers, financial experts) was held in October2016); the main purpose of the work shop was to point to the most important challenges –and solutions – in financing of energy renovations.

The conclusion was that there were three main challenges:

Challenge 1. The valuation of houses are not updated by law and does not include the energy standard:

The house owner can finance up to 80% of the house value based on the mortgage bond system which has the lowest interest rate. The added value to the house after renovation might be only a percentage of the renovation costs; 50% of the better energy standard is reflected in the sales price (Energistyrelsen, nov. 2015).

In Denmark in 2016 deep energy renovation was challenged by low energy prices, economic boom and a lower political focus on energy and climate. With these changed frame conditions, it is no longer possible to argument for energy renovation just to save money. The argument needs to change from pay-back time on

energy saving to lifetime on improvement and the need for maintenance a house plus value on non-energy benefit such as comfort, health, convenience, value securing, comfort, smart technic etc. Beside this, timing is important. For engaging young families, the window of opportunity is they are buying their first house and for the empty nesters, the timing is when the children move away from home and they want a more convenient house with higher comfort. Unfortunately, the economic boom has that negative effect, that homeowners have less focus on economy and energy savings and more focus on very visible improvement such as a new kitchen or bathroom.

The energy related improvements with added value in comfort and heath etc. do often not add the real value (real value compared to the cost) to the house.

Challenge 2: Attractive packages of energy renovation offers for the end customer are missing:

The second challenge has a strong connection with the valuation. If total packages for deep energy renovations can be made, it is probably easier to show the added value to the house. A package of deep energy renovation, with 50-80% energy reduction, requires typically an investment between € 50.000-100.000. In this way 80% of the investment can be financed by mortgage bond loans as in the most cost efficient way while the remaining 20% can be financed with the house owners' equity or bank loan. The total subsidy part for a deep energy renovation is typical not higher than € 2.500, which is less than 2,5-5% of the total investment.

Challenge 3: The Finance sector is not given authority to require professional energy checks- up as a condition for an energy loan. The sector lacks knowledge about the advantages of energy renovation.

Concerning the third challenge, it is today a problem that financial consultants do not require an energy check-up and a long term renovation plan as a condition to secure the loan at attractive conditions. A legal framework could serve as an incentive for banks to require this, for instance in order to qualify for grants or subsidies for the homeowners. Also, the financial institutions do not count with experts on energy renovations. The energy consultants that can deliver an energy check-up might have the technical expertise, but a cooperation relationship between the two sectors is not established. This means that the customer has to navigate him or herself between these two ecosystems.

Customers today demand easy one- shop stop solutions or a long-term plan for step-by-step renovation. Package solutions therefore need to include consultants that can both give advice on the energy renovation and the financing of the renovation.

Challenge 4: The subsidies and fiscal instruments are very low and limited

It is a challenge that the financial support via subsidies is very limited (2-5 % of the total investment for nZEB renovation). Today Danish homeowners only have a possibility to withdrawn 3000 EUR maximum per house on the tax bill for hiring a craftsman. That is a very little amount compared to the cost of a nZEB energy renovation, that typical costs more than € 60,000- 100,000. This lack of subsidies in combination with low prices on oil and electricity do no encourage homeowners to invest in energy renovation.

1.6.2 Danish recommendations for the future

Based on challenging frame conditions, low oil prices and decreasing interest from homeowners in energy renovation more supporting fiscal instruments need to be taken into consideration for reaching a nZEB standard.

The experiences from the present financing scheme for houses with a tax deduction of the tax bill and possibility to sell the energy savings are only small grants compared to other systems of other countries, e.g. the kfW system in Germany. In Germany, the grant is proportional to the increase on performance In Flanders (Belgium), there is a tax deduction on property, when homeowners a certain energy performance level after renovation. It can be concluded that there is a need for developing a similar system of linking the financing to deep energy renovation ambitions for houses.

In Denmark there is a certain effect of EPC on house prices, maybe more significant than in other analyzed countries, but still the effect could be even better provided that the Danish regulation for valuation houses was updated. It is therefore recommended to investigate the possibilities of a new regulation for valuation of houses, so there is a better relation between valuation of the house and the EPC energy standard.

Another recommendation is to provide a regulatory framework so that financial institutions are motivated to offer favorable energy loans linked to an energy check-up of the house. In this way, the bank advisers make sure that the loan is given to a wise and secured investment in the house.

It might not be feasible to change the system of house financing based on mortgage bonds for instance by forcing issuers of bonds to add the full cost of the deep energy renovation to the value of the house. There is a risk that such an action could undermine the whole system leaving house owners with more debt than the selling value of the property. However, it might be possible to have customized bonds for deep energy renovations based on the model of the mortgage bond financing system.

In a future system, the financial institutions together with the energy utilities and the Danish government could establish a bond system to finance up to 80% of a deep energy renovation of a house like the financing system for houses/renovation of houses. The bond system could be split in two phases: the first approx. 70% could be similar to the existing financing scheme whereas the remaining 10% could be financed from a more comprehensive subsidy system. This would change the subsidies into a loan making the loan package more secured and therefore more financially attractive. Instead of giving a direct subsidy to the house owner (for instance from selling the energy reduction), a suggestion could be to place this money in a fund at the bond issuer. This would cover the financing of all house owners making energy renovations.

Ideally, the scheme should be limited to deep energy renovations meeting minimum standards. The scheme could be based on special energy saving bonds with a long repayment period (up to 30 years like the present Danish bonds for house financing) and an interest rate at the same level of normal Danish bonds (at present approx. 2% per year). The startup cost of establishing this bond-based loan should be further investigated as well as how to deal with the transferred of the cost to a new owner of the house.

A financial scheme as mentioned above, combined with better education of real estate consultants, bank advisers and the preparation of renovation packages for deep energy renovation could make the uptake of renovation easier and more attractive for house owners. With the support from the financial institutions, energy utilities and the government, it would be possible to establish such a “energy saving bonds system”.

Moreover, Danish politicians will look closely to the experiences in Sweden. The latter has implemented a new subsidy system for house maintenance to create jobs and to raise awareness on resource efficiency and circular economy.

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2 Belgium (Flanders region)

2.1 SELECTED SEGMENT

In Flanders (Belgium), the main building typology for residences is the single-family house, as it covers 70% of the housing market. This market share is even higher, when only considering the private owner market: 85%. Based on the figures in Table 3, there are 2.104.892 single family houses in Flanders. More in detail, 42% of the single-family houses consist of detached houses. Terraced houses and semi-detached houses make up for 31% and 27% of the single-family houses, respectively.

Table 3: Volume of single family houses in Flanders by building typology. Source: [FOD, 2015]

type of single family house	volume (#)	volume (%)
Detached	887.508	42%
semi-detached	570.240	27%
Terraced	647.144	31%
TOTAL	2.104.892	100%

It is remarkable that only 18.4% dates post-1990, see Table 4. Considering that regulation related to energy performance in Flanders was not implemented before 1990, it is clear that more than 80% of the single-family houses was built without any obligations regarding energy performance. In fact, there is a distinct correlation between building age and energy performance. The older the dwelling, the worse its energy performance.

Table 4: Relationship between building age and ratio of single family houses in Flanders. Source: [Steunpunt wonen, 2015]

Building age	ratio of single family houses
> 1945	23.4%
1946 – 1970	31.0%
1971 – 1990	27.2%
1991 – 2005	14.0%
> 2005	4.4%

Two market segments, both related to single family houses, were put forward for REFURB's nZEBrenovation packages in Flanders [REFURB D4.2, 2016]. The first segment is the "Young families": adults between 25-44 years with children (or a children's wish) and a house with a calculated energy performance lower than 400 kWh/m² per year. The second segment are the so-called "Empty nesters": adults between 45-65 years old and a house with building age between 1971 and 2005. In the case of the Empty nesters, the grown-up children have left the house and a new life phase for the homeowners has started.

However, when evaluating possible instruments to finance nZEB renovation, there are dweller segments that have to be considered, as well as these specific cases might need tailored financial solutions:

- Private homeowners in the lowest income segments: Private homeowners in particular who had to purchase a home with poor quality to prevent additional rental costs, but cannot afford needed renovation works (the Dutch term is "*noodkoper*", literally translated as "emergency buyer");

- Owner/renter: In the case of owner/renter, there is a split incentive for energy renovations: the owner is the one who invests in the renovation, but it is the renter who benefits from the reduced energy costs. One can further distinguish the following situations, depending on the level of involvement of a social housing corporation: private owner / private tenant; private owner / social renter or social owner / social renter;
- Co-owners in apartment buildings: Again, there is a split incentive. The benefits of nZEB renovations are likely to be unequal for each co-owners. Furthermore, not every co-owner will have the same financial means. Finally, the juridical structure of Home Owner Associations (in Belgium: *vereniging van mede-eigenaars*, VME), often with the involvement of a syndic provides an added complexity (or opportunity);

2.2 ENERGY PERFORMANCE AND REAL ESTATE VALUE

The Energy Performance regulation in Flanders and the role of the Energy Performance Certificates were already discussed in other Deliverable reports [REFURB D2.1, 2015][REFURB D3.2, 2016].

Since 1st of January 2012, it is mandatory to indicate EPC-related information in advertisements when selling or renting residential buildings in Flanders. This information includes a numerical value, which represents the energy-score of the dwelling (characteristic primary energy consumption per year, expressed in kWh/m²). In practice, 86% of the advertisements meet this requirement. Nevertheless, the impact of energy performance criteria on the real estate value is still limited, compared to other parameters such as location, architectural quality, equipment and interior of the dwelling and are rarely used as an argument to negotiate the price for selling or renting, although it is actively used by homeowners as a criterion to compare dwellings on the market [VEA, 2014]

A study performed under the framework of the ZEBRA 2020 project pointed out two key points of improvements with regards to the relationship between EPCs and real estate value of dwellings [ZEBRA, 2016]:

- To increase the extent to which energy efficiency is incorporated into decision-making in the housing market;
- A key limitation with current EPC schemes is the lack of financial estimates for recommended home Improvements.

Concerning value estimation of houses there does not seem to be a common valuation standard in place in Flanders. Whether energy performance is included in the valuation thus can depend on the expert party who valuates the property (this can be: architect, real estate agent, land surveyor, notary). The study conducted a market analysis (using regression analysis) and a survey among real estate agents in eight countries (in 8 countries (AT, FR, DE, IT, NO, PL, RO, ES)). While the situation in Belgium was not within the scope of the ZEBRA 2020 project, there are also market analyses and surveys available for the Flanders region in Belgium, which resulted in similar findings.

First, a survey of energy experts and real estate agents pointed out two main improvements to increase the understanding of the EPC [VEA, 2014]:

- Using an energy efficiency class (A++, A+, …, G) with corresponding color, in accordance with the conventions of the Energy Label Directive

- Indication of the relationship between the simulated energy result and actual energy consumption (usage or energy cost)

Current upgrade of the EPC (in progress) aims to have a more realistic figure (taking into account less negative default values etc.). In addition, a methodology for renovation audits will be elaborated, taking better into account user behavior aspects (like actual energy consumption etc.)

An issue here in Flanders is the fact that it is also difficult to compare actual energy consumption with the calculated result.

However, two studies which analysed the effect of EPC on selling and renting prices of dwellings with regression analyses did indicate a positive impact. A national study indicated a decrease of 0.75% of the selling price of a single family house in case the energy-score increased with 10%. In case of an apartment unit, an increase of 10% results in a decrease of 0.28% [KUL, 2014]. Furthermore, a European study of the Flemish building stock showed that an improvement of 100 kWh/m² in the energy score (termed here a "major improvement" in energy efficiency) corresponds with a 4.3% higher price, on average. The rent effect was smaller but still statistically and economically significant: an improvement of 100 kWh/m² in the energy score is associated with a 3.2% higher rent [BIO, 2013].

The EPC of residential buildings in Flanders is currently under revision in the context of the Flemish Renovation Pact and the improvements that will be implemented are likely to improve the impact of energy performance characteristics on the selling and renting prices of houses. First, it will provide information on expected energy savings and investment costs in order to renovate existing buildings into nZEB. Second, the benefits of renovation will be made more clear to homeowners, in particular the expected increase in energy savings, comfort, indoor air quality, functionality etc. and this in a visual, easy-to-understand way. Third, the instrument will facilitate to compose a renovation masterplan, either step-by-step or in one go. The upgrade of the EPC is expected to be implemented in January 2019 [VEA ©, 2016].

2.3 EXISTING FINANCING SCHEMES

Currently, there are still few innovative financing schemes applied for the renovation of residential buildings in Flanders. Current toolbox consists of conventional financial instruments, steered by the national and regional public authorities. This is complemented with loans of the private financial sector.

Prior to 2016, financial constructions specifically targeted at nZEB renovations were non-existing. However, there are recent policy initiatives that address this gap and try to create a shift in the right direction.

Existing financing schemes in Flanders were already partly covered in other REFURB deliverables. There are numbers of options for financial support of renovation available with various public authorities. The main challenge for homeowners is to compose the optimal combination of these financial measures. In summary, a distinction can be made between financial stimuli and financial constructions:

1. **Financial stimuli: Reduction of the investment cost**
    a. **Grants and subsidies** for individual energy-efficiency related renovation measures of the building envelope or the technical installations. Different rates apply, depending on the fact if renovation works were carried out by a contractor or on a do-it-yourself basis. Additional options are available for selected target groups (i.e. using income limits as selection criteria). Since January 2017, additional support is granted for staged deep renovations and collective renovations (see Box 3.2 and Box 3.3).

   b. **Tax stimuli** such as tax deduction for selected renovation measures and decreased VAT-tariffs for renovation works. New since January 2017 are property tax deduction linked to energy performance targets of renovated buildings (see Box 3.2).
2. **Financial constructions: Loans which increase investment capacity**
   a. **Loans by private (financial) bodies** or **consumer loans** for specific renovation measures and target groups, eventually linked to energy performance targets.
   b. **Loans by public bodies** for energy-efficiency related renovation measures, with more beneficial interest rates for specific target groups.

Regarding these financial instruments, as there are a lot of different options available which distributed among various public and private bodies, it is a challenge for homeowners to have an overview of the possibilities and to make an optimal selection. Financial unburdening of the homeowner therefore is a point to consider when composing the renovation packages.

A distinction has to be made between tax deduction and *property* tax deduction.

Tax deduction (for instance, for selected renovation measures such as roof insulation) are being replaced by other tax stimuli (taking the roof insulation as an example, since 2017 there is no tax deduction anymore, as it is replaced by the ”deep renovation grant”)

Property tax deduction: this was already applicable in case of new build (for instance, low energy houses with E-value better than 30 kwh/m^2) and now it also applies for deep renovated houses.

The disadvantage is that people are not really encouraged to do better (they will stop at 60 kwh/m^2), that it only applies for people with a building permit after 10/2016, and indeed the larger the property, the bigger the (tax) advantage

Besides these financial instruments, there are other options available to decrease the investment costs of either individual renovation measures or the total renovation, mainly related to the approach of the renovation process:

- **Group purchasing**: In Flanders, this is commonly applied for PV-panels, as there currently are no grants available for PV-panels by the public bodies (in contrast to solar thermal boilers);
- **Collective renovation**: A collective approach of renovation has the potential to decrease costs by advantages of scale;
- **Do-it-yourself**: A straightforward solution to cut costs of renovation, is to conduct a part of the renovations by the homeowners themselves. However, the quality of the renovation works are then a point of attention. There are market-initiatives that target this user-segment by offering coaching services of do-it-yourself renovation;
- **Step-by-step renovation**: A staged approach of renovation allows to spread investment costs over time, although this solution is not necessarily cost-efficient in the long-term.

The renovation packages which will be developed within REFURB, can certainly benefit from the existing possibilities of financial instruments. To illustrate this, a number of recent developments and cases are covered more in-depth:

Box 3.1 Warmer wonen portal: towards financial unburdening

Warmer Wonen connects the offers for renovation-support
To enable homeowners to find their way in the myriad of initiatives to make renovations (financially) more

attractive, the regional housing renovation program Warmer Wonen serves as a portal for the homeowners.

Warmer Wonen groups the housing renovation actors in the region that Leiedal covers, a region of 13 cities and municipalities in the Kortrijk area. The platform serves as a one-stop-shop for homeowners. They can find the relevant information via a dedicated website (warmerwonen.be), as well via other modes. E.g. a renovation coach can filter and bring the right information/offers that apply to the specific situation of the homeowner.

This platform itself connects to other existing tools and data-sources, e.g. a search engine on all subsidies for housing renovation in the Flemish region, information on: low income loans, how local actors can help with an energy check-up, organizing a group purchase of insulation material, renovation coaching, a building equipment library, advice on sustainable building etc.

Warmer Wonen streamlines what already exists, to make it more comprehensible for the homeowner. The REFURB-step is to re-organise it from the perspective of the renovation process of the homeowner, and adding building blocks and tools to lead them through the customer journey, e.g. MyEnergyCompass (mijnenergiekompas.be) and a renovation coach (for which a business modell is developed).The concept has been a success in terms of cooperation of stakeholders, but there is still growing potential towards the homeowners. [LEIEDAL, 2013]

Box 3.2 Grants for deep renovation and property-tax reduction

BENO-pass: Deep Renovation Bonus from the Distribution system operator (DSO)

By reforming the energy grants in 2017, the Flemish government wants to encourage owners and landlords of existing residential buildings to move towards a higher energy efficiency [Infrax, 2016]. The Government has tightened the rules to be eligible for an energy grant and has also introduced the Deep Renovations Voucher. The latter is a bonus to be used when performing several energy efficient renovation measures. The following 7 investments are supported by the DSO:

1. roof or ceiling insulation of at least 30 m²,
2. wall insulation (cavity wall, exterior or interior wall) with a surface of at least 30 m²,
3. floor insulation with a surface of at least 30 m²,
4. new glazing with a surface of at least 5 m²,
5. sun boiler,
6. heat pump,
7. ventilation system.

In a period of five years, a minimum of three of the above renovations and/or techniques should be executed to receive a bonus of € 1.250. The more energy savings measures are combined, the higher the bonus. If all seven listed investments are implemented, a total of € 4.750 is paid by the DSO. For apartments, 50% of these amounts can be obtained [Dubo Limburg, 2016]. The program has been launched re It has been launched only recently. It is too early for results. A recent study on the effect of earlier grant

measures however indicate that the grant system mostly benefits high educated people.

Reduction of the property tax for low-energy buildings

A fiscal advantage has been introduced by the Flemish government to encourage low energy consumption levels in the residential sector. Both deep energy renovations and new buildings that need a building permit are eligible for the measure [VLAIO, 2016]. A reduction of 50% to 100% on the property tax is granted for a period of five years. The reduction depends on the year of the building request and the E-level of the building [VO(a), 2016]. The E-level is an indicator that is calculated for the Energy Performance and Indoor Environment application and that expresses the energy performance of a building (For more information, see annex 3 of [REFURB D3.2, 2015]). The lower the energy performance, the more the building and its fixed installations/equipment are saving energy. There is the EPC-regulation: indeed, an EPC is required when a dwelling is sold/rented. Result of the EPC is the ”energy-score” in kWh/m² per year

Then there is the EPB-regulation: in case of new-build or major renovations, an energy performance assessment is mandatory but the method is slightly different than the EPC-method. To start, the result is E-value (for instance, E60 is the target for nZEB renovations) which corresponds more or less with an energy score of 100 kWh/m².

The goal of the Flemish Energy agency is to work towards one method that applies for both situations. This is one of the key boundary conditions in the current work on updating the EPC-method

Box 3.3 Grants for coordinating collective renovations

Neighbour grant for collective renovations

Since 2017 a new energy grant for collective renovation projects has been introduced: the “neighbour grant”. In this context, a collective renovation is defined as a project with at least 10 dwellings situated in a street, neighbourhood or municipality. A project supervisor (the “nZEB-coach”) supports dwellers in the realisation of collective energy savings investments. Therefore he or she should dispose of sufficient architectural, technical and financial knowledge for a comprehensive approach. The role of the nZEB-coach is to unburden the dwellers by taking over as many tasks as possible, such as the energy check of the dwelling, advice on the energy renovation and approach, the search for building contractors, site monitoring, administrative support for grant requests and financing etc. The renovation measures that will be eligible for these collective renovation projects are in-line with the renovation measures of the BENO-pass (see Box 3.2). The project supervisor will receive the grant, which is a maximum of € 400 per dwelling in case of single family houses [VO(b), 2016].

There are some points of attention that have to be taken into consideration when applying for the position of BEN-coach:

The risk of household dropping-out seems to imply a financial risk for the nZEB coach, as he or she will only receive the grant at the end of the renovation process (after completion of the construction works). As a result, the neighbourhood grant in its current version seems to apply more for the renovation of apartment buildings with home-owner associations, in which there is less risk of participants dropping-out during the journey.

In addition, as the grant per participant is limited, the efficiency of the collective renovation will most likely largely depend on the nature of the participating renovation projects. For instance, a collective renovation of ten projects with the same renovation measure (e.g. roof insulation) will require less effort and will be

easier to manage than a collective renovation of ten deep renovation projects or various renovation measures (and thus involvement of various contractors is needed)), although there seems to be no distinction in the received grant amount. This could not only have financial implications for the nZEB coach but could also decrease the financial scale-advantage of the collective renovation for the participants.

Finally, the task-description of the nZEB coach is rather extensive and it is still unclear which competence level is required and which qualifications there are needed.

To conclude, it is the first time in Flanders that there is a financial support targeting collective renovations. As the system is still in an implementation phase at the time of writing, it is still difficult to evaluate its full potential, but it certainly can be of value for REFURB and deserves to be taken into account when composing REFURB's renovation packages.

2.3.1 Energy Performance Contracts (EPCos[3])

In Flanders, Energy Performance Contracts are already applied in the public building sector by the Flemish Energy Company (Vlaams Energie Bedrijf, VEB). A pilot has been realized in 2016: the public psychiatric care center in the municipality of Rekem. A Energy Service Company (ESCO) guarantees an annual energy saving of more than 30% for a period of 9 years [VEB (a), 2017].

However, there are items that have to be taken into account when applying EPCo in the residential building sector:

- EPCos are mainly applied on non-residential and/or public buildings such as schools, offices;
- The potential energy savings have to be large enough. This means that there needs to be a minimum amount of the energy bills. For instance, VEB specifies an amount equal or greater than € 500.000per year [VEB (b), 2017]. Thus, the project needs a certain scale;
- Estimated energy savings have to be as accurate as possible. Information on the current and future user profiles therefore are very important. In particular in case of individual residential buildings, user behavior in function of the energy performance of the building is difficult to predict but can have a major influence on the actual energy consumption;
- The selected energy saving- and renovation measures have an influence on the payback times of the investment and the duration of the EPCo. When the EPCo focusses on measures related to the technical installations, a duration of 10 years is feasible. However, measures related to the building envelope have longer payback times and could result in EPCo with a contract duration of 15 to 30 years.

Applying EPCos in residential buildings therefore seems more feasible for apartment buildings of certain size, in particular in the case when there is a collective system in place for heating and domestic hot water production. In addition, there is a single owner such as a housing corporation or co-owners are organized in a Home Owner Association, which means that there already is a single party that can operate as a facilitator to negotiate the EPCo with.

There were successful pilot projects in Europe that demonstrated the potential of EPCo for the (nZEB) renovation of single family houses, such as Stroomversnelling Koop[4]. However, there are a number of factors that have to be taken into account and which make it rather difficult to accomplish in this market segment:

[3] Not to be mistaken with Energy Performance Certificates (EPCs)
[4] http://www.energiesprong.nl/

- A certain scale is necessary and therefore a collective approach of the renovations is needed. As an illustration, the projects of the Stroomversnelling concerned collective renovations of 1.000 to 2.000 dwellings;
- The nZEB ambitions and the renovation measures related to the building envelope can have a significant impact on the payback times and duration of the contract. Again, taking the Stroomversnelling as an example, the duration of the EPCos were 30 years;
- There need to be one (intermediate) party to have the EPCo with. In the case of individual households, there need to be a kind of cooperative structure set-up or another organization has to operate as third party between the ESCO and the households. Furthermore, this intermediate party need to have the necessary technical, financial and juridical skills. Technical support to set-up the EPCo therefore might be necessary, such as the ELENA-fund (see chapter 2). In the case of Stroomversnelling, this role was taken up by housing corporations or municipalities.

2.3.2 Revolving (loan) funds

A revolving loan fund can provide financing or loans to projects related to energy efficiency or renewable energy and which result in energy savings or (real estate) value increase.

A revolving fund links energy performance ambitions and loan conditions (e.g. requirement of 20% and 30% of energy savings, and better loan conditions in case a better energy performance is targeted). The requirement of an energy audit and technical planning of renovation prior to the loan The energy savings are used to repay the pre-investment or loan.

The KredEx Revolving Fund in Estonia is a good example of a successful revolving fund project for energy retrofitting of residential buildings implemented in Europe [FEDERANE, 2015]. In Belgium, two pilots are implemented, one in the city of Ghent (see Box 3.4) and one in the province of Limburg (see Box 3.5).

Box 3.4 CLT Gent

Community Land Trust tool

In the renovation program “Dampoort Knapt Op” (Ghent, Belgium), an innovative financial solution is tested: a “Community Land Trust”-model (CLT). This is a financial tool to solve investment problems with low income homeowners with a dwelling with major quality issues. These homeowners face problems to loan money from banks. The homeowners get € 30.000 from the CLT to invest in renovation. This increases the value and comfort of the dwelling. The money is only to be paid back when selling their house (plus a fee). In the project, the community is strengthened through stewardship.

Box 3.5 Duwolim Plus

Duwolim Plus, the renewed Renovation loan from the Province of Limburg

DowuLim Plus is a revolving fund with interesting loan conditions (up to € 40.000 for a period of 10 years) for renovations of residential houses. It is a Belgian example of a loan for energy efficient renovations offered by a local authority. With resources of SALK (the Strategic Action plan for the Province of Limburg), the Province provides € 3,4 M for the organization of the fund. It’s starting point is the current Flemish Energy Loan (€ 10.000 in 5 years per house). An additional loan with comparable interest rates is superimposed. The Duwolim conditions are of course linked to qualitative advice, counselling and control by the partners concerned. Five municipalities of the Province of Limburg offer an interest free credit on

the first disk of € 10.000 to all homeowners. With this system of a subsidized interest local governments want to trigger less affluent people to perform energy efficient renovations [DUWOLIM, 2016].

2.3.3 Soft loans

Soft loans are loans with rates and payback periods that are below market conditions. In case of nZEB renovations, in order to qualify for these favourable conditions, certain requirements related to energy performance ambitions (e.g. nZEB level) or energy performance assessment (e.g. a mandatory energy audit) might have to be met. A well-known example are the loans offered by the KfW development bank in Germany[5]. There are a number of private financial banks in Belgium that offer soft loans related to energy efficiency requirements (see Box 3.6).

Other soft loans might be only applicable to certain market segments (e.g. based on household income).

Box 3.6 Renovation loans for House Owner Associations in the city of Antwerp

Renovation loan for House Owner Associations

A recent example of a soft loan for energy renovations is the renovation loan for House Owner Associations of apartment blocks. The loan was negotiated between a local authority (Ecohuis, a department of the city of Antwerp) and a private bank.

Figures of Ecohuis showed that there are 750 apartment buildings in Antwerp with more than 20 dwelling units, with a total potential renovation cost of € 45.000.000. This clearly showed the potential market for financial institutions. A new financial product was developed, specifically targeted to House Owner Associations and as such, filling a gap in the market. Moreover, loan rates are better when compared to loan rates for renovation works of private homeowners. [Stadslab 2050, 2016]

2.4 CHALLENGES AND RECOMMENDATIONS FOR BELGIUM

2.4.1 Belgian challenges according to experts

Two regional initiatives are already discussed within the topic of financing nZEB renovations: Renovatiepact and Knowledgeplatform.

Renovatiepact

The Renovationpact is a collaboration of the Flemish government and regional stakeholders in the building sector with the purpose to develop an action plan for a significant increase of the renovation rate in Flanders and the optimization of the energy performance of dwellings towards nZEB level. This plan should enable a maximum use of European, federal, regional and other financing mechanisms that support energy renovations of dwellings.

Within the Renovation Pact, a Financing Taskforce has been brought to life to work out actions regarding financial support and financing mechanisms. Intercommunale Leiedal is part of the Financing workgroup. Other experts are contributing as well, such as the AG Energy savings fund (in Dutch: Autonoom Gemeentebedrijf Energiebesparingsfonds) of the city of Antwerp, procuring low-cost loans to citizens to make their dwelling more energy efficient; the Belgian federation of the financial sector Febelfin; and CIB

[5] www.kfw.de

Vlaanderen, the confederation of the Flemish real estate sector. The Financing Taskforce focuses on 4 main financing themes [VEA (a), 2016]:

Challenge 1: The need for pre-financing: Renovations up to nZEB level require a high upfront investment. However lower energy and operation costs and an increase in the value of the dwelling only take place on the longer term and therefore need to be assessed in a correct way to convince the home owners.

Challenge 2: Steering the commitment of available resources towards (a good combination of) energy renovation investments, living quality, comfort, safety and health. Grants do not always bring universal happiness and can have unwanted side effects. They should not lead to higher bills for renovation works and are not meant for affluent families only.

Challenge 3: The need for financial resources for unburdening and counselling of dwellers for the preparation and implementation of energy saving investments

Challenge 4: A higher deployment of fiscal instruments to stimulate energy saving investments

The main challenges pointed out by the experts of the Financing Taskforce are brought back to the following three sub taskforces [VEA (b), 2016]. Some of them have led to real life changes by now, such as the new policy initiatives described above.

The optimization of housing taxation to support renovations of existing dwellings. The initiative of reducing property taxes for low-energy buildings, as described in Box 3.2, is a first step. On the long term housing taxation should be based on energy performance and living quality (possibly along with other criteria).

The development of new business models for innovative support mechanisms, such as guarantee funds, Energy Performance Contracting, renovation cooperatives (as described above), crowdfunding initiatives etc.

The mapping of grants with the aim to realize long term goals. These can be supporting measures for phased, individual or collective energy renovations and can be for specific target groups, periods, locations or generic. An example of a location-specific grant was described in Box 3.3 about collective renovations in the same neighborhood.

Kennisplatform renovatie

The Flemish Renovation Knowledge Platform6 (in Dutch: Kennisplatform Renovatie) creates a positive innovation climate for deep renovations of dwellings. Their workshop 'Innovative financing models for deep energy renovations in the residential sector' was organized on 26 May 2016 together with VITO and the Passive House Platform Pixii. Relevant information and real practice examples were shared amongst participants and interactive sessions were organized. The morning program was focused on actors in the construction world interested in innovative financing mechanisms; the afternoon program was specifically tailored to partners (the Social Housing sector and the private residential sector) from the VLAIO Living Labs (in Dutch: 'Proeftuinen') [Kennisplatform Renovatie, 2016].

The project of the Living Labs wants to stimulate renovation concepts, which can lead to payable solutions on a big scale. For ten real renovation projects throughout Flanders, a set of solutions is studied. These solutions are meant to be applicable for collective renovations, if possible nZEB renovations. These renovations do not really have the intention to convince individual building owners, but rather governmental institutions, who are looking for solutions for collective renovations. Both groups of partners

[6] http://www.kennisplatform-renovatie.be/

(public and private sector) have some challenges in common, other financial challenges are very specific for the social rental market.

The following keynote speakers presented their real life experiences regarding innovative financing models at the workshop: Sven Wuyts from Factor4, one of the frontrunners in Europe in the field of performance based energy savings projects; Ivo Opstelten from Platform31, a Dutch knowledge and network organization that keeps a watchful eye on the trends within cities and regions; and Eric Gaspard from Région d'Alsace- ADEME, a French Environment and Energy agency. The most important challenges discussed together with the experts and participants and the lessons learned from the workshop are summarized below [Kennisplatform Renovatie, 2016].

First, in general Belgian homeowners are suspicious of performance based energy savings projects. They have many questions regarding reliability, independence, financing, verification etc. On the other side there is need for trust by the investors. Increasing the demand with large-scale television shows or by 'faming and shaming' pointed out to be decisive in the Netherlands and France for gaining the investors' trust. Political decisiveness also proved to be of great importance to develop and execute an integrated energy renovation program. For energy performance contracts combined with up-front financing by a third party, financial institutions attach importance to the solvency and thus the company size of the third party offering the guarantee. Risks and uncertainties such as cold winters, fluctuating energy prices, rebound effects, technical risks etc. still remain major challenges.

The economic growth and low prices on oil and gas in 2015-2017 have had a negative effect on the interest on energy renovation and energy saving. The low oil and gas prices in general mean longer payback rates for renovation measures concerning building envelope improvements and also punish technologies on electricity such as heat pumps, while technologies such as condensing boilers on gas and even oil are actually more cost-efficient as a result of these low prices.

Ideally, they are spread over three parties, which are the client, the investor and the ESCO. Examples of EPCs in the Belgian residential sector only exist for apartment buildings (as already discussed in earlier). Dwellers are represented by one party (the association of co-owners) to facilitate communication. These associations still have a lot of disbelief and distrust towards ESCOs and typically do not have a long term vision. Moreover, the appeal to existing success stories is not possible yet and suppliers are mistrusted because of competition in the market is almost non-existent.

Then, the 'King or Castle' principle, was discussed during the workshop. Research in the Netherlands demonstrated that the type, size and condition of the building (Castle) are determining factors for the average energy cost, not the factors related to the users of the building (King). Nevertheless, loans are granted based on the income of the family and energy labels are not (fully) appreciated yet by important actors in the housing market.

Finally, French experiences revealed that, despite the extensive offer of interesting grants and low-interest loans for energy measures, nZEB renovations were not achieved. The average home owner was overwhelmed and not encouraged to start deep energy renovations. Therefore actions were taken to simplify nZEB renovation projects for home owners and to create a package offering unburdening, financial incentives and education of construction firms. At regional level (the Alsace region), a Special Purpose Vehicle (SPV) was put in place to give interesting conditions and support for renovations, and local renovation platforms were created. The regional government offers the necessary objectivity and proximity. Additionally, attractive third party financing (linked to the European Investment Bank) will be offered in the future.

The local renovation platforms coordinate the administration. For the first 6 years an equity capital of € 8,6M is needed. The region contributes with 45% and the local governments with 22% or € 0,4 per inhabitant which should help to convince private investors (who contribute with 33%) Also the validation by the 'Caisse des dépôts et consignations' (a French public financial institution) is important for this project and helps to convince other investors and banks.

Third party financing hypotheses show an overall cost of average renovation projects of € 50.000 to € 70.000 (€ 450/m²), and an average sum lent through third party financing of € 23.000 over a period of 15 years. The ROI should be 4,3% and the interest rate for home owners 2,2%. Such a low interest rate is very interesting for the home owners.

2.4.2 Belgian recommendations for the future

After evaluating the existing and potential financial and valuation mechanisms in Flanders (Belgium), the following key observations can be made:

First, in the Flemish region, large-scale financial instruments are lacking and are still limited to pilot projects on a local scale. On the other hand, there are many financial incentives available to stimulate energy renovation measures. As a result of on-going policy initiatives such as the Renovationpact the options specifically targeted at deep renovations are increasing. However, as there are a lot of different options available among various public and private bodies, it is a challenge for homeowners to have an overview of the possibilities and to make an optimal selection. Financial unburdening of the homeowner therefore is a point to consider, when composing the renovation packages;

Second, there are two success factors (among others) that seem to recur in each innovative financing scheme:

- The financing mechanism is linked to energy performance and/or renovation requirements. Furthermore, there are schemes which reward more ambitious performance targets with better financial conditions;
- The financing mechanism is linked with technical support, requiring for instance an energy audit or renovation advice to guarantee that the energy performance ambitions and resulting energy savings will be achieved or the quality of the renovation will be ensured[7]. Furthermore, this technical support can be an integrated part of the financing scheme. For instance, energy audits could be a prerequisite to benefit from financial loans. Another possibility is that the technical support is funded through the financial program.

Finally, with regards to the relationship between energy performance and market price, market studies using regression analysis techniques indicate that energy performance can have a positive impact on the real estate value of the house. Surveys among real estate agents seem to indicate that the EPC can be improved to further stimulate this effect.

Improvements can relate to making the EPC and the expected benefits more visually understandable, providing cost information of renovation measures and expected energy savings and showing the relation between the simulated energy score and the actual energy consumption. Also a common standard for

[7] For instance, in the KfW-bank, where an audit is required and the energy performance of the renovation need to be verified before granting the loan.

value estimation of houses where energy performance is a central element could push the market and the demand for nZEB renovations.

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3 Germany

3.1 SELECTED SEGMENT

In general, private persons who own single family houses have been identified as promising focus groups in the REFURB project. In the region of Halle however, the German partners ISW and BHL consider multi-family houses to be the most important segment. To facilitate an EU-wide comparison of financing possibilities, this section focuses on privately owned single family houses in general.

In previous deliverables, private home owners have already been identified as an important target group for nZEB, not only because they have a huge share in the German housing stock, but also because they are independent in the decision making process regarding their own house, which makes them a promising target group for energetic renovation.

Table 5: Residential buildings and dwellings in Germany (Census data per 9th May 2011)

	residential buildings		dwellings	
private individuals	15 968 275	84,4%	23 728 707	58,5%
condominium owners associations	1 767 017	9,3%	8 956 434	22,1%
housing cooperatives	288 767	1,5%	2 086 456	5,1%
municipal property	332 089	1,8%	2 294 244	5,7%
private housing companies	316 086	1,7%	2 183 183	5,4%
others	250 384	1,3%	1 296 293	3,2%
total	18 922 618	100%	40 545 317	100%

The housing stock in Germany contains approx. 40,5 m. dwellings in 19 m. residential buildings. Most of the residential buildings (84%) and also most of the dwellings (59%) are in the ownership of private individuals. A second factor is the residential buildings resp. dwellings that are property of community associations, which means a group of private individuals, mostly managed by property professionals. The three types of housing companies (private, municipal, cooperative) have almost the same share in residential buildings (between 1,5% and 1.8%) and dwellings (5,1% to 5,7%).

Owner and tenant rates show a characteristic share in Germany (approximately 45%/55%). These rates differ between East and West Germany and between urban and rural areas. In Saxony-Anhalt the share is 42%/58%.

Of the 19 m. residential buildings in Germany, more than 12 m. are privately owned single family houses. Almost half of these single family houses have a size of 100 to 139 m², about 14% are between 80 to 99m² and between 140 and 158m².

3.2 VALUATION OF HOUSES

There is only one scientific source so far, that deals with the effect of the 'Energieausweis' on house values.

According to the Study "The impact of Energy Performance Certificates on property values and nearly Zero-Energy Buildings - an analysis for professionals and users - Zebra2020"[8], the following findings referring to the sales market seem to be of interest: For the time before 2014 only a very small effect of EPC on house prices was identified. From 2014, no effect could be shown, probably due to a statistical bias, which needs to be further analyzed. At this point, no reliable statement can be made on the effect of EPC on house prices in Germany.

To sum this up, the effect of the 'Energieausweis' on house prices in Germany is either non-existent or needs to be researched further. During the work on WP5, the 'Energieausweis' will be analyzed in depth. In this process, it will probably be possible to name reasons, why the results of the 'Energieausweis' are not represented in the value of the house yet.

3.3 THE EPC SYSTEM AND ITS EFFECT ON HOUSE PRICES

In Germany, new and existing houses are obliged to live up to very high energy standards. The so called 'Energiestandard' describes the degree of energy performance. It determines the maximum energy consumption per m² reference surface per year in a building. In general, this value can be reached by structural measures and housing technologies. User behaviour is not included. The legal context of the 'Energiestandard' is given by EnEV[9] (Energieeinsparverordnung = energy saving ordinance), that defines basic standards. The EnEV applies for almost all buildings with heating or cooling systems. It primarily refers to new buildings and should help to reduce their energy demand. Secondly, it refers to the energy standard of the existing building stock, which is relevant for the nZEB renovation: There are minimum standards for the refurbishment measures ('renewal and refurbishment requirements'). If the owner wants to insulate the façade or to replace the windows, he has to observe certain U-value limits given by EnEV.

To sum up, owners of single family houses in Germany have to comply with very specific regulations provided by EnEV when refurbishing their house. Compliance will be examined by either the chimney sweep or the contractor. In addition, many houses are already partly refurbished (e.g. new windows, new heating supplies), which can imply problems with possible lock-ins, when additional measures are being taken.

Although there are no reliable data available, with a high probability 'empty nesters' and 'young families' are promising segments in Germany for (deep/staged) renovation measures: the 'empty nesters' preparing their house for old age by reducing fixed cost and increasing comfort and accessibility, the 'young families' aiming for a comfortable and modern house for their children to grow up in.

When building, changing or expanding a building, the 'Energieausweis' (energy pass) has to be issued and presented on request. Since 1st July 2009, it is officially required for all heated or cooled buildings that are assigned for rent or for sale. The duty to issue an energy pass is recorded in the EnEV. The energy pass has to be presented to the prospective tenant/buyer no later than he is visiting the dwelling or the house. Energy passes are scaled similarly to the efficiency classification of household appliances (from A+ to H) and contain specific energetic values (QP and H´T). For existing buildings, the 'Energieausweis' can be issued based on either a calculation of the energy demand or a measurement of the energy consumption, depending mainly on the year of construction and the use of the building. Publicly accessible buildings need to display their 'Energieausweis' visibly. Each energy pass contains tips for cost-efficient renovation

[8] http://zebra2020.eu/publications/the-impact-of-energy-performance-certificates-on-property-values-and-nearly-zero-energy-buildings-2/.
[9] http://www.vz-nrw.de/enev

measures. Non refurbished single-family homes often are assigned to EPC classes G (200-250 kWh/m²/a) or H (>250).

An energy pass is not necessary and needed for getting a loan. If homeowners are not selling the house, it is voluntary choose to get an energy pass.

3.4 EXISTING FINANCIAL POSSIBILITIES

There are several financial drivers for private owners of single family houses to start renovating their house. Reducing energy costs and running costs are one aspect. The other main aspect is the preservation/ increase of the value of the house. Examples for financial barriers are a general lack of financial resources, uncertainties about the future (threat of unemployment etc.), unwillingness to take out (another) loan or an exhausted credit line.

Once the house owner has decided that he or she wants to renovate, there are several options of financing renovation measures, if he or she can´t or doesn´t want to cover the renovation costs with cash:

Renovation measures are usually not financed with mortgages, if the amount needed is less than € 50.000, since the banks often ask for a significant interest increase for these comparatively small amounts. The cost and effort for registering the mortgage are usually too high compared to the amount of the loan.

Another option is to take up a special **bank loan for renovation or modernisation**, which one will get from the bank as long as it is used for measures which increase or at least preserve the value of the house itself. This includes renewing the roof, the façade or the windows and renovating the bathrooms as well as measures applying to water pipes, electrics or heating installations. The interest rates are usually relatively low these days (between 1 and 2%), but depend on the amount, the home owner's capital and income as well as on other individual circumstances.

Another option is to take up **a loan from the KfW-Bank**. KfW is a government-owned development bank in Germany, which is, amongst others, active in the field of housing and environment and specializes in supporting energy efficient renovation and building. In order to finance measures of energetic refurbishment, the bank provides loans at reduced interest rates, as well as grants and subsidies (see Section 3.6). The loans are associated with the abovementioned energy requirements and regulations of EnEV. KfW-Bank developed specific standards ('KfW-Effizienzhaus'). The basic principle is to undercut the baseline of primary energy demand (QP) and transmission heat loss (H'T) of a certain reference building in a couple of stages. E.g., 'KfW-Effizienzhaus 55' means that QP amounts to maximum 55% and the H´T amounts to maximum 70% of the reference building (EnEV2009). There are higher levels possible for refurbishment of existing buildings (KfW 85, KfW 115).The standard 'KfW-Effizienzhaus 40 Plus' is the most advanced standard. These houses can produce energy, store it and thus are able to provide the small amount of additional energy they still need for themselves. In connection with these standards, KfW developed a system of loans, that the home owner can receive either for the achievement of a certain KfW level or for single refurbishment measures.

Box. 4.1 Overview of loan model "Kredit 151"

'Kredit 151': If the house is renovated towards a 'KfW-Effizienzhaus' this loan can be received. The home owner can get up to € 100.000 per dwelling. The interest rate is 0.75%. The higher the 'Effizienzhaus'-standard is after refurbishment, the higher is the repayment grant, which means the home owner does not have to pay back the full amount of the loan. For a 'KfW-Effizienzhaus 40 Plus' he or she receives: 15% of the grant amount as a repayment grant (up to € 15.000). For a 'KfW-Effizienzhaus 40': 10% of the grant amount as a repayment grant (up to € 10.000). For a 'KfW-Effizienzhaus 55': 5% of the grant

amount as a repayment grant (up to € 5.000).

Box 4.2 Overview of loan model "Kredit 167"

'Kredit 167': If a new heating system based on renewables (solar thermic systems, bio mass, heat pumps, combination of fossil fuels and renewable energy) is installed, this loan can be received. The home owner can get up to € 50.000 per dwelling. The interest rate is 1.11%. It can be fixed for up to 10 years.

Another financing option, which is usually used for financing new heating systems is 'contracting': The contractor puts up the heating appliance and is responsible for its operation and maintenance. The contractor's investments are refinanced through a share of the costs for the energy saved or through a fee charged for the delivered heat, cold or electricity.

3.5 EXISTING SUBSIDIES FOR ENERGY RENOVATION

KfW is a government-owned development bank in Germany, which is, amongst others, active in the field of housing and environment and specialises in supporting energy efficient renovation and building. The bank not only provides loans at reduced interest rates with repayment grants depending on the KfW-Effizienzhaus standard reached. It also provides grants/subsidies to house owners for energy efficient renovation (deep or staged) and for having the energy efficient renovation supervised by a professional energy consultant.

Box 4.3 Overview of Grant "Zushuss 430"

'Zuschuss 430': If an investment is made in the energy performance of the house, this grant can be received of up to € 30.000 per dwelling for insulation (walls, roof, ceilings), new windows, new heating or ventilation systems. The grant can be provided for investments that lead to a certain KfW-Effizienzhaus standard or for single measures.

Box 4.4 Overview of Grant "Zuchuss 431"

Zuschuss 431': If an investment is made in the energy performance of the house, this grant can be received of up to 50% or € 4.000 for planning and supervision of the renovation process by a professional expert for energy efficiency. This grant only works in combination with other 'Kredit 151' and 'Zuschuss 430' and other programmes, which are less relevant in the context of the REFURB project.

In addition to KfW-funding, the development banks of the federal states ('Bundesländer') often provide special funding for energetic renovation. The terms for these funding opportunities differ very much from federal state to federal state and depend, for example, on regional characteristics, regarding climate, urban and rural development goals, housing stock etc.

Results of the 'Energy-efficient Refurbishment' program in 2014[10]

The KfW programmes 'Energy-efficient Refurbishment' (Energieeffizient Sanieren) and 'Energy-efficient Construction' (Energieeffizient Bauen), funded by federal grants, are the most significant providers of financial incentives for more energy efficiency in the German housing sector. The two programmes aim to

[10] Arbeitsgemeinschaft Institut Wohnen und Umwelt GmbH und Fraunhofer-Institut für Fertigungstechnik und Angewandte Materialforschung IFAM - Abteilung Energiesystemanalyse - (2015), Monitoring der KfW-Programme „Energieeffizient Sanieren" und „Energieeffizient Bauen" 2014. (https://www.kfw.de/PDF/Download-Center/Konzernthemen/Research/PDF-Dokumente-alle-Evaluationen/Monitoringbericht_EBS_2014.pdf)

promote energy savings and greenhouse gas reductions as well as encouraging investments. For the Refurb Project the KfW programme 'Energy-efficient Refurbishment' will be examined in more detail:

Under the programme, energy-saving refurbishment projects are promoted by loans at favourable conditions or grants. In 2014, just over **97,000 promotional commitments to modernise about 230,000 dwellings** were allocated. Individual or combined measures as well as complete packages seeking to achieve a 'KfW Efficiency House' were promoted. To reach this standard, the building must not exceed predefined values for its primary energy demand and its total thermal insulation.

In about 53% of all promoted buildings and 97% of the KfW Efficiency Houses, thermal insulation measures have been carried out. The compliance with quality standards (e.g. insulation thickness) go far beyond the requirements set out by the Energy Saving Ordinance (EnEV). In 63% of the promotional cases, the main heat supply system was replaced; this applies to 81% of KfW Efficiency Houses. Solar systems (solar thermal or PV) were installed in 16% of the modernisation projects and in 48% of the KfW Efficiency Houses respectively. Ventilation systems – mostly together with heat recovery – have been installed in about 6% of all promotional cases or 32% of the KfW Efficiency Houses.

These promoted modernisation projects' **annual final energy savings amount to 1,400 gigawatt hours per year** (or 1.4 billion kilowatt hours per year). This figure is based on the usual marketable energy sources (i.e. fuels, electricity and district heating excluding solar and ambient heat).

Approximately **1,900 gigawatt hours of primary energy** (considering non-renewable energy sources) are calculated to be saved annually.

The **reduction in greenhouse gases** because of the targeted modernisation measures in 2014 amounts to a value of about **514,000 tonnes of CO_2 equivalents per year**. In addition to the direct emissions of the greenhouse gas CO_2, indirect upstream emissions related to the retrieval of the respective energy sources and CO_2 equivalents of other greenhouse gases were taken into account.

Heating cost savings add up to approximately € **155 M per year**. Assuming an average lifetime of 30 years for the energy saving measures applied, total savings in heating costs over this period would amount to € 5,1 billion (present value discounted to 2014).

The table sets out key characteristics for the programmes 'Energy-efficient Refurbishment' and the predecessor programme 'CO_2 Building Rehabilitation' (CO_2-Gebäudesanierungsprogramm) for the years 2005 to 2014. The CO_{2e}[11] and final energy savings are shown in relation to the status before modernisation.

Table 6: Energy-Efficient Refurbishment / CO2 Building Rehabilitation Programme: Characteristic values 2005-2014

Promotional cases from	Dwellings considered	CO_{2e}-reduction [tonnes per year]	Final energy savings* [GWh per year]
2005	70 000	340 000	670
2006	155 000	700 000	1 520
2007	89 000	330 000	940
2008	134 000	546 000	1 530
2009	363 000	955 000	2 680
2010	344 000	847 000	2 450
2011	181 000	457 000	1 250

[11] CO_2 equivalents

2012	242 000	576 000	1 720
2013	276 000	650 000	1 750
2014	230 000	514 000	1 370

* district heating, electricity, fossil fuels, biomass

3.6 CHALLENGES AND RECOMMENDATIONS FOR GERMANY

3.6.1 German challenges according to experts

Challenge 1: House owners often decide against deep renovation and go for single measures or a stepwise approach

Scientific analysis of aspects regarding energetic refurbishment measures, which also has to be taken into account the KfW loans and grants[12] show that private homeowners believe that the financial support of KfW was important for the successful implementation of their renovation measures. Since the financial support of KfW increases with increasing standards after the renovation, incentives are offered to go for a deep renovation.

Nevertheless, only a few of these deep renovations are completed while a stepwise approach prevails. In countries that support deep renovations and single measures equally, mostly single measures were requested. Additionally, the house owner needs to decide the standard to achieve with the renovation before starting the works. That is why the house owners using the KfW support go through with the renovation as planned, while others may reduce the ambitions of the renovation in the process. Overall, the available support by KfW is extensive and contributes to ambitious renovation measures, but it should be even more extensive for nZEB renovations in order to motivate more house owners to strive for that.

Challenge 2: EPC ('Energieausweis') needs further improvements to be trusted

Currently the EPC presents energy efficiency indicators (energy consumption in kWh per m²). Including information on the operational costs which could be expected in a certain building after renovation could improve the comprehensibility and the usability of the EPC for the average house owner/buyer.

It is necessary, to improve reliability of and trust in the EPC so that home owners consider the EPC in important financial decisions, like buying a house.

Challenge 3: Technical potentials and funding need to be tapped in practice

- Only one in three homeowners uses energy-related consultancy
- Only 40% of the homeowners benefits from funding
- Only 31% of the homeowners implements a hydraulic balance

Challenge 4: Transparency is the first step towards taking action

Without transparency there is a large risk of customers' dropping out. In order to prevent that:

- Taking advantage of the opportunities of digitalization: heat meter, smart meter rollout, open interfaces for measured data both as tenant and owner
- Monitoring (energy-saving account) shows energy savings and deviations on short notice

[12] DIW Wochenbericht Nr. 34.2011: Energetische Sanierung: Handlungsbedarf auf vielen Ebenen.

Challenge 5: The customer's needs should be paramount (it often differs from engineers' desire)

To remedy, it should be taken into account to:

- Help topics for renovation, energy efficiency and climate protection as a first step
- Linking with other funding instruments (e.g. burglary protection etc.)

3.6.2 German recommendations for the future

Overall, the funding possibilities in Germany are satisfying. Nevertheless, improvements are possible primarily referring to the motivation of homeowners to start a (deep) renovation. Firstly, to make people take action of a deep renovation, funding for reaching a 'KfW-Effizienzhaus' standard should be even higher and therefore much more attractive than single measures. This way, more nZEB renovations could be achieved. Nevertheless, it is necessary to evaluate beforehand, if a significant reduction of emissions can generally be more easily achieved via a smaller number of deep renovations or a high number of single measures.

Apart from that, funding bodies should reward the results achieved by energetic renovation measures. The data generated can simultaneously be used as an evaluation of the funding programme. Additionally, there should be more incentives for using the know-how of energy consultants and for using monitoring and appropriate assessment tools. The opportunities offered by digitalization should be used as evaluation and as a motivation for house owners, who can easily monitor their increased energy efficiency and thus feel satisfied with their investment.

If the concept of the EPC is revised and reliability of this instrument increases, it could be a step towards including the energy performance of a building into the assessment of its value. This would create more transparency for buyers and rewards sellers that have invested in the energy performance of their house.

Generally, it could be helpful to focus general information on energy efficiency renovation and especially funding-related information not only on the possible energy and money savings, but also on other relevant factors, like improved comfort, healthy living and modernisations. Additionally, the possibility of combining funding for measures that reduce energy demand with more other useful measures, like burglary protection or reducing barriers, which is already practised by KfW, could make investments in energy efficiency more attractive.

The EPC should be strengthened, in order to increase the importance of energy efficiency as a factor in the buying-process. Investments in energy efficiency should increase the value of the house accordingly. There is no information about if the relation on value setting on houses are updated.

Funding opportunities of the development banks of the federal states should more easily be combinable with KfW-funding.

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4 The Netherlands

4.1 SELECTED SEGMENT

The owners who form an interesting potential market have been described as “Young Families” and “Empty Nesters”. The two segments that have been described in earlier chapters (see chapter 4.2) are the “the single family houses”. A cut off building date of 1964 is sometimes used, with an upper range of 1974 (sometimes) 1980 also being used. In this dwelling segment both detached and semi-detached houses are included. Estimates (1) of the numbers of these homes are as follows:

Table 7: Number of dwellings in the total housing stock

Type	Number of dwellings	% of total housing stock in the Netherlands	Private owned
Detached houses built up to 1964	441.000	6,5%	91%
Detached houses built between 1965-1974	119.000,	1,8%	95%
Semi-detached houses built up to 1964	285.000	4,2%	84%
Semi-detached houses built between 1965-1974	142.000,	1%	84%
Terraced houses built up to 1945	523.000	7,7%	71%
Terraced houses built between 1946-1964	478.000	7%	57%
Terraced houses built between 1965-1974	606.000,	9%	47%
Total	**1.900.000**	**37,2%**	**70%**

This adds up to approximately 1,9 million homes. This estimate is comparable to the estimates made by the national ‘Stroomversnelling (2)’, the national innovation program aimed at energy neutral renovation concepts. Publications quote 1,8 million homes built between 1945 and 1990, and that 70% of these are privately owned. This is about 1,25 million homes (2).

Research (Stroomversnelling; 2) has suggested that one third of these owners would be interested in receiving an attractive offer for a nZEB renovation, equivalent to 400.000 home owners. Finding the right finance for this group would obviously provide a large opportunity.

4.2 EXISTING FINANCIAL POSSIBILITIES

Basically three forms of financing are available for the home owner. Either the owner has his or her own capital, or a loan need to be taken, of part of the costs may be covered with subsidies. A combination is of course also possible.

Own capital?

The Dutch consumer advise bureau ‘NIBUD’ looked at which financing method home owners would use; their own money or a loan. 50% of the home owners who would be considered as owning suitable homes for nZEB renovations (1) have funds of around € 18.000. One quarter has more than € 60.000 (**Figure 2**). This does not mean of course that they would want to spend their money on nZEB renovations.

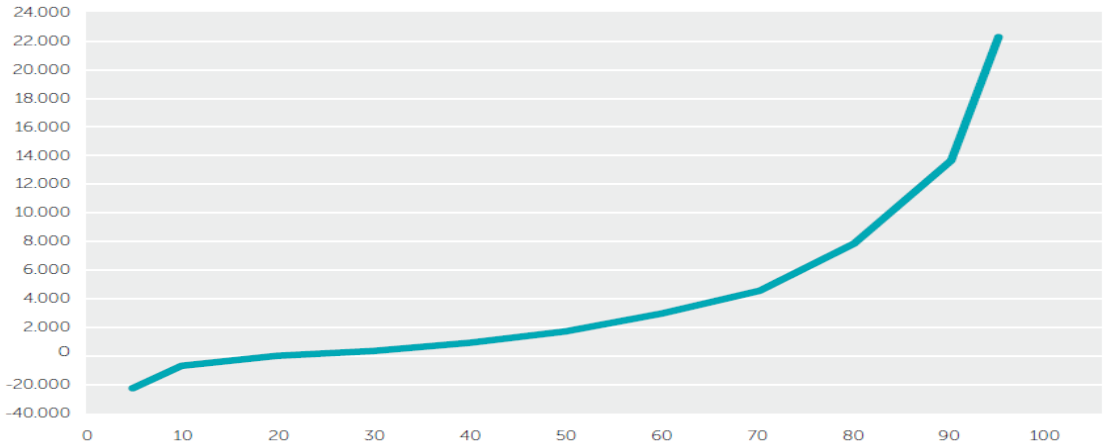

Figure 2: Available capital home owners in target group (available capital left and percentage of target group that have these funds below (3).

The return on investment is an important incentive in an investment decision. In theory, an investment in a nZEB, based on the Dutch example of 'NOM" (4) house renovations, would give a larger return on investment (estimate 3,7%), than interest earnt with savings in the bank (0,5- max 1,9%)

The theoretical availability of funds seems at this moment in time not sufficient to encourage many home owners to invest.

Loans (innovation)

Loans are often based on two principles:
- loan to value (borrowing based on the value of the property), and
- loan to income (borrowing based on the income of the borrower).

The amount allowed to be leant depends on the income of the borrower and/or the value of the property. Generally, the maximum loan-to-income-test in the Netherlands means a maximum ratio of 4,5 to 5 (LTI ratio) is allowed.

The Dutch program 'Stroomversnelling (2) aimed at innovation in zero energy renovations, has carried out extensive research into the possibilities for home owners to invest in these types of renovations using LTI loan principles. The calculations made have been designed to show if, an individual house level, owners are able to provide enough finance to carry out the required renovation. NIBUD (5) calculated that 760.000 home owners in the target group had an LTI ratio of less than 4. These owners would, in theory, have enough available lending capacity to carry out a renovation costing € 45.000, whereby the loan payments would be the same or less than the money saved by cuts in energy bills. Using loans in combination with their own capital would make the investment even more likely. An example of how this would work is a house with energy label F/G with an energy bill of € 2.100 per year . This payment would enable (net

present value) an investment of € 45.000, with the same yearly payment (€ 2.100) for a loan for 25 years at a fixed interest rate.

For loan to property concepts this is basically similar to energy service companies (ESCOs). At the time of writing this seems to be the most interesting financing concept for nZEB renovations. This entails that not the owner, but a company provides the finance linked to the property, and the owner pays a fee/interest that's the same as the energy savings. If the property is sold, the 'loan' transfers to the new owner.

Examples in the Netherlands of these types of financing are given below. One of the interesting possibilities is that these services could be offered by the energy network providers, because they already deal with the energy bills of customers. Linking new services, like nZEB renovations, seems to be an interesting concept.

Apart from these concepts there is also, in terms of ideas to provide extra finance, the 'green' mortgage. There are also (relatively) new possibilities in the Netherlands. (6, 7). Basically, there is an extra lending capacity (€ 27.000-34.000) over which a lower interest rate is paid (1-2%) for 10 years. This comes with a special certificate known as the 'Dutch Initiative for Energy and Environment (NOVEM 8). The maximum mortgage is limited to 106% of the value of the home, including renovation work.

Concluding, there are several loan based concepts that are being tried out in the Netherlands. Many home owners will have different possibilities, depending on their individual situation.

Effect of energy saving on the renovation value of the property.

While the above is about creating extra finance possibilities, there can be some other effects directly related to the loan, of the value of the property. These can be either negative or positive.

There have been studies trying to estimate the increase in value of a property after carrying out energy saving renovations, or based upon the energy performance of the buildings. One study by TIAS VastgoedLAB[13](9) found that G label homes were € 16.000 less in value than average, while an A label home was € 6.000 more. This is a positive effect.

A possible negative effect is the reduction in lending ability of the borrower, and the reduction of the value of the property, due to some financing schemes. Banks seem to operate different standards[14] (5) in assessing the effect of, for example, alternative loans linked to the property or financing based on leasehold constructions. Some may take account of service costs when calculating the lending capacity of borrowers. Service cost renovations may then effect the borrower's ability to borrow money for other purposes. These are especially relevant when considering the large amount needed for nZEB renovations.

4.3 EXISTING SUBSIDIES FOR ENERGY RENOVATIONS

In the Netherlands there are a wide range of schemes at national, regional and local level. The most important schemes are listed below. The national website will provide a wide range of subsidy information[15] (10).

A selection of number of examples have be listed in the table below, including schemes that, in the own assessment, are most relevant for a discussion about which types of financing would be needed to

[14] Page 31 'Stroomversnelling Nederland 4,5 miljoen woningen naar Nul op de Meter'
[15] http://www.energiesubsidiewijzer.nl/

encourage home owners to carry the proposed nZEB renovations. There are example of schemes, many of which are based on the energy service company finance (ESCO) concept but applied to single homes. These concepts have been explained above.

The table does not list subsidy schemes, although these are widely available for all types of measures. The focus in this chapter on innovative loans or mortgages is based on an assumption, that these are the financial instruments needed to achieve nZEB renovations. Subsidies or 'free money' can have short-term effects but will probably be unable to provide long term solutions. Typical subsidy schemes are those like a new national 20% subsidy for a minimum of two energy saving measures, introduced on the 15th of September 2016 (11).

Having stated this, one subsidy scheme is worth mentioning because it was implemented by the Province of Friesland, one of the REFURB partners. The 'Zero on the Meter' [16i]subsidy provided a sum of € 9.500 for a renovation reaching nZEB standard. As a pilot, funds of total € 450.000 were made available. These funds were all used up within 5 months and the scheme closed on the 31st October 2016. Demand is certainly present! The conditions can be found on the Dutch site (http://www.snn.eu/nulopdemeter/) (12)

Table 8: Examples of Dutch innovative financing schemes for energy renovation

Lender or scheme initiator	Type	Sum (€)	Interest rate (%)	Payback limited to (€)	Length (years)	Comments
Bank	Raised Mortgage specially for energy saving	≤ 27-34.000	1-2% less than standard rate	Unlimited	10	Gross yearly income needed ≥ € 33.000 + energy performance guarantee of ≥ 10 years (13)
Bank	Loan (classic)	25.000 – 50.000	≈ 5,0	Unlimited	varies	Really a normal loan without a specific link to energy saving, but worth mentioning as an option. (15)
National Energy Saving Fund (NEF)	Energy saving loan	2.500 – 25.000	2,1 2,4 2,8	Unlimited	7 10 15	The national energy saving loan offers a low interest rate, and the loan can be paid off at any time without penalties. It is also in some cases tax deductible. Max age of lender is 75 years. (19) For a loan up to € 5.000,- there is a seven year payment period. For a loan from € 5.000,-15.000,-there is a ten year payment period. For a loan above € 15.000,- there is a payment period up to fifteen years This loan could be more attractive because there are less extra costs normally associated with a mortgage (legal fees etc.).
Municipality of Leeu-	Energy saving	Unlimited	Own capital or	unlimited	Na or depe	Individual integrated home renovation and finance saving plans are made with

[16] http://www.snn.eu/nulopdemeter/

warden	guarantee		combined with a loan		ndent on combi natio n with loan condi tions	guarantees. Including monitoring results and advice (20).
Municipality of Leeuwarden	Energy savings loan	2.500 – 7.500	≈ 2,0	Unlimited	10	For homes with a value of less than € 250.000 (16)
Deventer	'Woningab onnement' Property linked loan	Property linked loan	na	Saved energy bill due to measures	15-20	The supplier of this service carries out the work and give a guaranteed saving on the energy bill. The owner pays a monthly fee for this. The fee is the same as the amount saved on his/her energy bill. (5)
Stichting [H]eerlijk Wonen (SHW)	Property linked loan		na	Saved energy bill due to measures	30	The lender provides funds with a total value of 30 years expected energy bills and renovates the house to energy neutral. The customer pays a monthly payment based on their energy bills (5)
Ontwikkelaa rs / Corporaties	Property linked loan		na	Saved energy bill due to measures	10-40	Guaranteed energy performance scheme . The service provider received a return on investment of about 5,25%. (18)
(Friese) ESCo	Property linked loan		na	Saved energy bill due to measures	na	Guaranteed energy performance scheme . Generally for projects above €100.000 (17)
Betaalbare Koopwoning en Zaanstad (BKZ)	Leasehold constructio n	Income dependant	na	Based on a one off payment for leasehold rights		The organization (BKZ) offers the possibility for some groups to purchase an energy efficient house through leasehold, enabling more funds to be available. BZK retains ownership of the site. (5)
Assen	Service costs private housing association (VVE)	Via service costs	na	Servicekost en	na	The service costs are used to renovate the building, and are passed onto the next owner. (5)

4.4 CHALLENGES AND RECOMMENDATIONS FOR THE NETHERLANDS

4.4.1 Dutch challenges according to experts

Talks with different financial experts in the field were carried out. Among these financial experts were: Rens Verbruggen (Stroomversnelling), Reint Brondijk (Sociale Verzekeringsbank), experts from the Triodos bank, Luuk Dijkhuizen (Freedom Energy) and Rob van Haren (Sustain).

Based on their expert view this top 5 of challenges concerning finances in relation to nZEB were put together:

Challenge 1: Loan to value is still a relatively new type of arrangement to stimulate nZEB renovation. But the problem is that it is actually not yet permitted by law. This poses a real barrier.

Challenge 2: There is a level of uncertainty whether the theoretical estimation of the amount of energy saved due to nZEB renovation will actually be reached in practice. Homeowners are often sceptical about the actual performance of measures taken. Will (all) the measures work as promised?

Challenge 3: The payback period for nZEB renovation is still very long. This foreseen long period of time can shy away homeowners that were initially interested in nZEB renovation.

Challenge 4: The amount of money that needs to be invested for nZEB renovation to be carried out to full extent is considerable. This financial burden can also shy away initially interested homeowners.

Challenge 5: Financial institutions are hesitant to provide loans for nZEB renovation for individual homeowners as they consider this to be a high risk financial product. Banks and other financial institutions prefer providing mass financial products to individual financial products. There also needs to be a considerable market for this type of financial product before they are willing to invest.

4.4.2 Dutch recommendations for the future

The possibilities for innovation in financing listed above seem to come down to focusing on how existing, mostly fixed expenditure, can best be made available to the home owner for renovation purposes. The possibility of adding expenditure on energy bills to existing normal long term loan or mortgage possibilities, is viewed as the holy grail by some. If the homes that are renovated are also increasing in value then the combination seems a theoretical winner.

There is considerable discussion in the Netherlands about alternative or innovative financial instruments that need to be developed to speed up the amount of energy saving measures currently being carried out. Loans for homes as opposed to loans for people are often being considered and reported on (21, 22). It seems that much work has been done in investigating these possibilities.Table 9 shows that different organisations are carrying out experiments with the above mentioned new financing concepts. Sometimes successfully and sometimes unsuccessfully.

This has not only received theoretical attention, but has become part of the national political discussion on energy transition. An example of this was an amendment passed in November 2015 in the Dutch parliament (23). This requires an investigation of the possibilities for the energy network companies to become investors in renovation through loan to property concepts.

One of the elements needed to be considered is the need to scale up experiments. The above concepts will probably have more chance of succeeding when scaled up. As with every innovation process, the concepts need to be developed and tested first. This is what is happening now in the Netherlands. Scaling up of financing, linked to quality assurance could provide big opportunities.

While the finance side is the focus of this chapter, the subject of finance can't be seen as a 'stand-alone solution'. Clearly quality assurance and the ability of the building industry to meet the needs of customers is just as, if maybe not more, important. There is a classical chicken and egg situation here. Before the customer decides, 'en masse' to buy new renovation concepts, there needs to be affordable financing and

quality guarantees. The financers and the builders are unwilling to offer both due to the current small size of the market. The key in the Netherlands, and probably in every country, is to break this cycle and provide the motor to large scale nZEB renovations.

Also, the focus on providing renovations to nZEB standard with no step by step approach is certainly an important issue to deal with. Customers/home owners are traditionally (and rightly?) conservative and careful. This is where the 'Stroomversnelling' principle in the Netherlands maybe concentrating too much on a 'one step to nZEB' approach. Providing a road map to achieving nZEB level living in steps will be an important principle. Finance solutions need to be flexible to cope with these demands.

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5 Estonia

In Estonia 76.5% of households own their home. This share is larger than in the rest of Europe, where 60.1% of households own their household main residence (HMR) on average. Comparison with other Euro area countries indicates that Estonia has a relatively high home ownership rate, as the rate is higher in only three countries: Slovakia, Spain and Slovenia. The median values of different real assets imply that the most valuable real asset households hold is the HMR. Its median value is € 44.900 for Estonian households. This is followed by other real estate property, for which the median value is € 27.200. (MERIKÛLL, 2016)(GLOBAL 2017)

5.1 SELECTED SEGMENT

The main dwelling type in Estonia is a multifamily house. About 75% of population lives in multi-family houses, where two thirds were built between 1960 and 1990. The average apartment in these houses is about 60 m² and has 1 or two bedrooms. The kitchens are tiny and so are the bathrooms.

Most of the houses were built of concrete blocks. Other materials such as sand-lime bricks or lightweight concrete blocks were used in lesser extent. The houses were designed to have natural ventilation utilising inflow through poorly sealed windows and doors. Thermal properties of envelopes were calculated based on avoiding condensation on inner surface.

Bearing in mind the massive character of residential building and the fact that any other type of dwelling was not easily available or affordable, the composition of residents was most heterogenic. These apartments were not owned by dwellers but rather rented from state owned management companies. The dwellings were later privatised on the beginning of the 90s but the composition of dwellers has remained heterogeneous.

In case of Tartu there are two groups of home owners that stand out:

a) Empty Nesters / retirees (EN-R) and

b) Absentee Owners (AO), the dwellings of who are sublet mostly to students (S) and such. Here we need to distinguish between home owners who make decisions and actual dwellers who live in the apartment.

A common defining feature for this dwelling segment is that every house constitutes a legal body which is responsible for all the maintenance and possible renovation. All decisions involving financial matters are subject to the general assembly of home owners of respective house.

5.2 ENERGY PERFORMANCE CERTIFICATES

The "Energiamärgis" ("Eenergy Label"), as the Energy Performance Certificate (EPC) is called in Estonia, is a document that provides information about how much energy the building consumes – in other words, how much energy is used for heating, electricity, hot water etc. in comparison with the average energy consumption of other equivalent buildings. [17]

17 Calculation of energy consumption is based on weighted net balance of energy i.e. Energy imported into building minus energy produced in the same building and includes all kinds of energy - heating, domestic hot water, cooking gas but also appliances and

If people are buying real estate they have the right to know the magnitude of the operating and maintenance costs. The energy label gives the building's energy efficiency class. The higher the energy efficiency class, such as A or B, the less money is spent.

In Estonia, an EPC for real estate is mandatory. According to the Estonian Building Act, the property owners are obliged to order the EPC whenever a property is built, sold or rented.

When an apartment or building is sold or leased out, the owner must show the energy label if the buyer or tenant wants to see it. If property is built then an EPC is always mandatory. Since 2013, the energy label class must be shown in a real estate advertisement.

Since 2015 an energy label is compulsory for buildings of more than 250 m², which serve large numbers of people, and it must be displayed in a visible location for visitors. Energy labels must be registered in Estonian Building Register.

The energy label allows common consumers to get a simple and understandable information on the theoretical yearly average energy consumption in the apartment or house. At the same time consumers will get an idea how much one should pay for energy and heat in new, intended to acquire room. The better the buildings energy conditions are, the higher the energy efficiency class is, the higher is the value of real estate to be appraised. The certificate includes recommendations on ways to improve the home's energy efficiency.

There are two types of energy labels in Estonia:

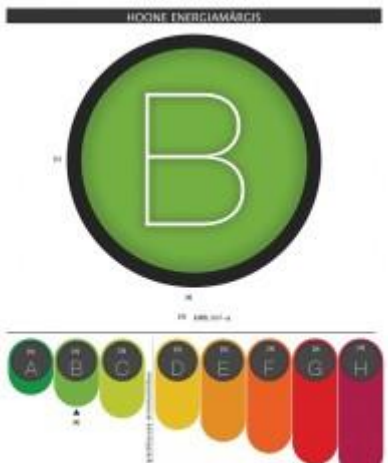
Common energy performance certificate (KEK, "Kaalutud Energiakasutus") issued for an existing building with the assurance of internal climate. This energy label may be issued by an undertaking person, that performs energy audits or issues energy labels. The validity period of an energy label that is issued by an undertaking person, that performs energy audits or issues energy labels, is 10 years as of the issuing of such certificate.

KEK is issued to existing houses.

Calculated energy performance certificate (ETA, "Energiatõhususarv" in Estonian) is given to new or significantly reconstructed buildings with the assurance of internal climate. Calculated energy labels may be issued by a designing company. The validity period of the energy label that is issued by the designing company is 10 years and this period starts with the start of the guarantee period of the building.

ETA is mandatory to new built houses and houses that are substantially renovated (according to EPBD guidlines). ETA is valid for ten years.

lightning. The weight factors are set by decree of Minister of Economy and Communication and at the beginning of 2017 were as follows:0,75for wood including pellets; 0,9 for district heating; 1,0 for fossile energy such a gas, oil, coal etc; 2,0 for electricity



EPC is often used together with another legal act issued by Minister of Economy and Communication, which states the level of energy consumption that a building of certain type shall not exceed.

Different levels of EPC correspond to building types:

A - nZEB

B - Low Energy Buildings

C - New Buildings

D - Significantly Renovated building

Although it is supposed to be a correlation between EPC levels and price of real estate it is not yet publicly acknowledged. Different estimates suggest that the price difference between renovated and not renovated housing is not higher than 15% and might be as low as 5%. In the near future stakeholders are anticipating the price difference to become substantial .The price difference is difficult to notice as prices vary substantially related to different other factors. In Estonia renovations of residential buildings have contest only for multi apartment houses. Unfortunately there are no studies but rather estimates of real estate companies. There is no official statistics connecting real estate prices and EPCs of these houses

At present there are clear differences in real estate prices related to EPC levels, but other qualities such as age and condition of building, local level of utilities and the location of the building are even more important for the sale price.

5.3 EXISTING FINANCING POSSIBILITIES

Slightly more than one third of Estonian households (36.8%) have outstanding debt. This share is lower than in the rest of Europe, which is 43.7%. About one fifth of households (20.7%) have mortgage debt and the majority of them use the household main residence as collateral, as 18.7% have borrowed against the HMR (household main residence) and only 2.7% have mortgages related to other property. The households

that have mortgages related to the HMR are also more likely to have no-collateralized loans, as about 43.5% of them have no mortgage debt. This share is much lower for households who rent their main residence or own their HMR without an associated mortgage (18% and 28.2% accordingly).

Younger households in Estonia are as likely to have debts as the households in the Euro area, whereas older households, where the reference person is 45 or older, are less likely to have debts and this difference with the Euro area increases with the age. The propensity to have outstanding debts is 65.6% for the 35–44 age group, decreases to 48.2% for the 45–54 age group, then more than halves to 23.3% for the 55–64 age group and drops further to 10.4% for the 65–74 age group (MERIKÜLL, 2016).

The debt-to-income ratio exhibits a lot of variation across households, where the reference person has different working status. It is the largest (113.8%) for households where the reference person is self-employed and the lowest (10.5%) for those where the reference person is retired. The debt-to-asset ratio is highest (23.3%) for households where the reference person is not working and lowest (2.6%) for those households where the reference person is retired.

5.3.1 Mortgage loan

In Estonia a mortgage loan system works basically the same way it does in other EU countries.

A mortgage loan may be used for funding housing-related costs, education or health costs, start-up of business and other important activities.

The minimum sum on mortgage loans is € 7.000. The sum of the loan may amount to 80% of the market value of housing, established as a security. The market value of collateral is appraised by certified appraiser and member of The Estonian Association of Appraisers. Collateral appraisal usually has a fee depending on the appraisal's price list.

Total monthly payments of financial obligations may amount to 50% of the net income. The maximum amount of loan payments depends on income, assumed financial obligations and the number of family members.

Interest rate of a mortgage loan is tied to Euribor. Euribor is a European Interbank Offered Rate. The choice is between a 3, 6 or 12-month Euribor rate. A client-based interest marginal is added to the Euribor rate.

Upon request, a mortgage loan interest may be fixed for a longer period. A mortgage loan with fixed interest rate provides assurance that the loan payments do not change over the period. A mortgage loan can be taken for the maximum term of 30 years and repaid before the age of 75. Suitable collateral to a mortgage loan is the housing (apartment or private residence) to be purchased or renovated in Estonia. The collateral shall be insured throughout the loan period.

Upon repayment of the principal part of loan, a grace period for up to 18 months can be applied for. Only interest rates are paid during the grace period. In this period, loan balance decreases more slowly (compared to a non-grace period) and thus the total interest expense paid on the loan increases.

5.3.2 Loan for renovation

Loan for renovation can be applied together with applying for renovation subsidy. The loan should cover the remaining 60% of renovation works. The main conditions for the loan:

- The loan can be used for the same purposes as the renovation subsidy

- Self-financing is 0%
- Loan period is maximum 20 years long
- Maximum amount depends on solvency of housing association (HA) and decisions of general assembly of the HA
- Interest rate is fixed for 5 years or 6 months Euribor with added margin. Usually banks suggest to use 3% for preliminary calculations if loan is applied for deep renovation
- Pledge of property rights is used as a collateral
- HA has to pass decisions on financial responsibilities which includes loans with "double majority" vote. Majority of the number of home owners who own majority of m² have to be in favor of financial decisions.

5.3.3 Apartment building loan guarantee (by KredEx Fund)

Loan guarantee is suitable for apartment buildings that wish to take a loan from a bank to finance renovation and work related to increasing the quality of life of inhabitants, but whose risk is evaluated higher than average by the bank (e.g. a high share of debtors, the apartment building is located in an area with low market value of apartments or in a monofunctional settlement, investment per m² is remarkably higher than the average), or who wishes to use the KredEx guarantee to insure the risk of payment difficulties.

Requirement for applicant:

- the loan recipient is an apartment or building association or apartment owners participating in a community or apartment owners.
- in the case of a community of apartment owners, the loan recipients may be represented by the administrator under an unattested authorization.
- the association or community shall be creditworthy.
- the loan recipient shall have a valid decision of the general meeting regarding the performance of renovation work, taking of loan and conclusion of a guarantee agreement. Renovation work is provided in the management plan of the apartment building.
- an apartment building is a building with at least 2 apartments.

Terms of guarantee:

- guarantee covers up to 75% of the loan amount
- the guarantee amount decreases proportionally to the loan amount
- guarantee fee 1.2-1.7% of the guarantee balance per year
- In case of payment difficulty, the loan recipient may submit an application to KredEx for temporary covering of payments by KredEx according to the payment schedule of the credit agreement. Payments to the bank by KredEx on behalf of the loan recipient do not constitute guarantee prepayment, liabilities of the loan recipient before the foundation arising from such payments are established in a separate agreement between them. In the case of a community, the

administrator shall be involved in collection of repayments to the foundation from the apartment owners, and also in issuing of claims against apartment owners, if applicable.

5.4 EXISTING SUBSIDIES FOR ENERGY RENOVATION

5.4.1. Subsidies for renovating multi apartment houses

When the apartment renovation program started in 2009 (KREDEX, 2009), the estimated average annual energy consumption in buildings that had not been renovated was 200-400 kWh/m² and at least 60% of this energy went on heating.

Before this program, Estonia had given apartment associations a grant of 10% of their renovation costs. A government-funded scheme available through KredEx helped improve housing conditions by financing energy efficiency in buildings. This scheme provided a 50% grant for energy audits and expertise as well as 10% for the renovation work itself. This did not, however, fill the market gap since grants were insufficient and were only given after renovations were completed. The scheme had not been very effective since the investment need was high while the scheme's capacity to invest was low. There was a market gap between the energy efficiency needed in apartment blocks and the financial assistance available. (KREDEX, 2016)[18]) Inspired by German renovation schemes, the Estonian government decided to introduce a financial instrument, that would make it more feasible for owners to renovate apartments.

In 2009, in the beginning of the economic crisis, Estonia implemented the Energy Performance in Buildings Directive. Prices on heating were beginning to be unbearably high and it was obvious that something need to be done to the housing stock. Also, there were attempts to reduce heating bills by occupants of these apartments themselves which often led to technically dubious results.

Therefore, in 2009 a financial scheme was launched. KredEx, a public financing institution, was the holding fund manager of the renovation scheme, receiving € 17,74 M of ERDF funds and attracting another € 48,97 M from public sources for the same purpose. Two banks distributed the funds to apartment associations who could rely on KredEx for technical assistance as well as help with energy audit grants, or guarantees covering up to 35% of their renovation costs. The subsidies consisted of € 37,7 M of which € 28,7 M came from selling Kyoto ETS to Luxembourg and € 9 M form smaller dealings. These funds were exhausted by 2014. Over 500 multifamily houses with 1,4 million m² were renovated (KREDEX, 2016). The second round of renovation subsidies was launched in 2015. Conditions for applying were changed to be more consistent with reaching maximum energy efficiency. It is now possible to apply for up to 40% (in some regions 50%) subsidies for renovation cost. The house needs to have certified indoor air quality consistent with EN-15251, class II and EPC not less than "C".

Although lower subsidies can be applied for, if high standards are not financially or technically feasible almost 80% of all applications aim for 40% of subsidies. The process is under way and the results are to be seen by the end of 2020.

[18] http://www.kredex.ee/en/energy-efficiency/energiatohusus-korterelamus

5.4.2 Grants for the reconstruction of small residential buildings

Reconstruction grants for increasing the energy efficiency of small residential buildings became available in November 2016. These grants enable up to 30% of the total cost of reconstruction to be covered, with the maximum grant amount being € 15.000.

Small residential buildings make up one third of Estonia's housing stock. The average energy consumption per square meter in buildings in Estonia is higher compared to the other EU Member States. Older small residential buildings are in a condition where their reconstruction is inevitable, in terms of both their long-term preservation and their energy efficiency. The purpose of the reconstruction grants for small residential buildings is to contribute to their increased energy efficiency and to cut the energy consumption.

Support is provided for all aspects of thermally insulating a house, upgrading its heating systems, additionally the acquisition and commissioning of equipment running on renewable energy sources, and any other works that contribute to a reduction in energy consumption. The calculated reduction in energy consumption had to reach at least 40% Analogous grants were provided through KredEx also in 2012, for 212 small residential buildings. At that time, the average cost of refurbishment was € 40.000, whereas the average grant disbursement was € 13.400.

Under the state budget strategy for 2017 to 2020, the plan is to fund grants for increasing the energy efficiency of small residential buildings during this period at the total cost of € 6,91 M.

5.5 CHALLENGES AND RECOMMENDATIONS FOR ESTONIA

5.5.1 Estonian challenges according to experts

A workshop concerning financing of renovation of residential houses would have been out of context in Estonia as government financing is probably going to continue for some time. The paradigm Estonia is in is different from that of other European countries, but similar to other countries that were a part of the USSR and consequently were not hit by the oil crises of the 70s. These countries continued to build the same kind of inadequately insulated houses for twenty years, up to August 1991. As a result Estonia has 50% of its population living in these houses.

Starting from the 90s there have been warnings that these houses are going to be a major problem in the future when they all need to be repaired and refurbished in a rather short time. Oil prices of over USD 100 per barrel have showed that if those prices persist for longer time than a few years, there might be a massive fuel poverty and 10% of the population falling below the "line".

Thus the Estonian government and Legislator started the above mentioned process of heavy subsidizing renovation of multi apartment houses.

The main challenges:

Challenge 1. Ability (or lack) of Housing associations to apply the loan for renovation and to service it. In areas where real estate prices are very low, the banks are not willing to submit loans for housing associations to renovate their buildings. Those areas are mostly smaller towns. where loans necessary to accomplish renovation exceed the value of the renovated property.

Challenge 2. Exhaustion of subsidies. The funds for current renovation subsidies were calculated to last up to 2020. Considering the present renovation rate, it will probably be exhausted before. Subsidies after 2020 are going to be available "if possible".

Challenge 3. According to the studies (KUND, 2014, LITHTMAA, 2014) made on example of Tartu housing associations the biggest problem seen form the associations themselves is a lack of initiative but also, although 61% of the associations can finance the renovation with a loan, only 28% qualify due to poor financial discipline which affects qualifying for collateral.

5.5.2 Estonian recommendations for the future

Analyses of possible future developments of housing sector under different conditions of subsidizing
A study was conducted in the framework of the Estonian Energy Program 2030+ (ARKAJAS, 2014) where different scenarios of housing developments were analyzed. The focus of this study was to predict energy consumption and the efficiency of the residential sector under different levels of state intervention.

The three scenarios are:

1. No intervening scenario S1 (BAU). Energy efficiency is achieved purely by the free market. Resources are routed somewhere else. EU requirements for energy efficiency are barely fulfilled.

2. Minimally intervening scenario S2. Existing resources are channeled to achieve the goals of the Energy Program and improve living conditions as efficiently as possible. This acknowledges the main concerns of housing - big energy consumption and bad indoor air quality.

3. Science based intervening scenario S3. Risks are taken by investing into high quality living environment and energy efficient dwellings. Bigger investments are justified by higher employment, stimulation of economy and potential for export.

The assumptions for the amount of renovated buildings and respective EPC under different scenarios are presented in the table below:

Table 9: Different Scenarios for renovated buildings

Type of building	Scenario 1	Scenario 2	Scenario 3
	% number of houses with energy label as mentioned below		
Multi Apartment	15% / E	30% / C	50% / C
Single Family Houses	10% / E	20% / C	40% / C
Non residential	10% / D	15% / C	20% / C
Schools, kindergartens			40% / C

Conclusions of this study became a good input for all stakeholders but especially for policy makers in order to make further decisions. Some of the results are presented in the following table:

Table 10: Results of different scenarios for renovated buildings

Characteristic	S1	S2	S3
Reduction of energy consumption 2010 vs 2030	-0,9%	8,4%	17,6%
Investment per year for multi Apartment houses, M€	3,47	20,54	47,93
Governmental spending / revenue, M€/year	3,6 / 17,5	40,5 / 57,5	126,2 / 111,8
Direct employment, man years per year	880	2850	5620

According to ARJAKAS; 2014 the KredEx program is an EU-program not negotiated and adopted by the Estonia parliament (actually it has been stalled). The subsidy program is not a pure financial measure but foremost considers the social aspects. All financial and conditions are not negotiable.

As for the future –there is no other plan or proposal than keep using the KredEx program, as long as there are finance possibilities here.

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6 Slovenia

Due to financial crises, Slovenia has very conservative banks, which mostly demand mortgages for bigger loans, which need to be combined with regular employment of the individuals and, in the case of SMEs (managers of blocks of flats), with very good and balanced, steady business.

Both of the selected segments in Slovenia:

- Young families in dwellings of private houses
- Owners/tenants in blocks of flats

have a rather low possibility to obtain favorable loans (most of the loans have an interest rate of almost 4% with fixed or flexible interest rate for an average of 20 years (based on 3 months or 6 month EURILOBOR[19]).

The rates are offered to prime banks on Euro Interbank term deposits. The EURIBOR is based on average interest rates established by a panel of around 50 European banks (panel banks) that lend and borrow from each other. Loan maturities vary from a week to a year and their rates are considered among the most important in the European money market due to the restrictive system of banks. There is no specific tax reduction connected to refurbishment of houses or blocks of flats (either for individuals or for SMEs (managers of the blocks of flats).

Since the interest rate of loans, even in the case of smaller loans, is rather high (4%), people mostly do not like to apply for loans, unless they are forced to do it. Additionally, since most of the loans are connected to a mortgage loan, it is a rather unfavorable measure.

6.1 SELECTED SEGMENT

60% of the flats in Slovenia (latest data from 2015) are in one or two house buildings. The rest of the flats (40%) are in multi house buildings. Since 2011 the data have not changed significantly, only 14.500 new flats were built up. (SURS, 2017)

Table 11: Volume of single family houses in Slovenia by building typology. Source: [SURS, 2017]

Type of flats in multi family houses	volume (#)	volume (%)	Dwellers
Flats in 1-2 house buildings (approx.. 97 m^2)	508.700	60	
Multi house buildings (approx.. 55 m^2)	336.700	40	
TOTAL	845.400	100%	1.995.500

Most of the flats and houses are in the ownership of the private owners (91%), 6% is in the ownership of the public sector (flats mostly for social and other tenants) and 3% in the ownership of companies.

[19] Euro Interbank Offer Rate - EURIBOR Definition | Investopedia http://www.investopedia.com/terms/e/euribor.asp#ixzz4Za6vfNdm

96.7% of all inhabitants in Slovenia live in flats. The rest of dwellers (3.3.%) live in joint flats or other forms of dwellings. In more than 162.000 flats there is only one dweller, mostly aged over 60 years. Over 80% of flats are privately owned. Included in the private owned flats are 71.500 user flats, which are the flats in which owner is not the person that lives in the flat, but at the same time the flat is not rented but owned by relatives (e.g. parents,..).

8.2% of all flats are rented. Among rented flats are mostly 70% non-profit rented flats, only one fifth of them is rented for profit. The average age of tenants of rented flats is 34 years. More than 80% of the rented flats are in multi flats buildings.

6.2 ENERGY PERFORMANCE CERTIFICATE (QUALITY ASSURANCE)

Energy performance certificate (EPC) was regulated by in EU in 2011 and has been obligatory in Slovenia since 2015 (PURES, 2015) when putting a house or flat on the market for sale. The ECP is based on EU and national regulations: Energy law, Rules – methodology for preparation of EPC, Rules about training for EPC, Rules about efficient usage of the energy in buildings (PURES), Technical rules, Rules about the costs for EPC.

The special regulation called PURES: Regulation about effective usage of energy in buildings, which was regulated by law in 2011 and defines measures for energy efficient new buildings and renovation of buildings (with important emphasis on housing - buildings). The regulation PURES is very strict, stricter than in some other EU countries and defines: value of the effective usage of energy, architecture, heat protection, heating, cooling, air conditioning, preparation of hot water, lighting, renewable, CO_2 and indicators).

When the house is built up or reconstructed the contractor or owner also need to prepare documentation for the energy performance of the building.

Due to the obligation of the energy performance certificate (put into force in 2015) (based on EU directive SAVE 93/76/EEC) so far only buildings that are on sale (in private ownership) (beside public buildings), need to have such energy performance certificate. There is a rule that the house cannot be put on sale if there is no energy performance certificate available.

The EPC label gives information to all investors, buyers of flats/houses, tenants, and real estate agents about the energy state of the building: heat protection of the building, usage of energy for heating and costs for heating. The purpose of the EPC is to give objective information and to support the market advantage of buildings with an EPC. In a long run, the EPC will be obligatory for all buildings in the state.

So far, based on latest calculations (see document http://drugg.fgg.uni-lj.si/4577/), the market value of the buildings on sale is higher to up to 22% if they have an EPC. Since there is not so much movement on the real estate market (seen from the figures above), the initial prices for buildings which are higher due to EPC, are usually not achieved when the building is sold.

The connection between Energy Performance and sales price
There is not clear evidence of connection between EPC and price that house/or blocks of flats achieved on the market, due to EPC was first implemented in Slovenia in 2015.

6.3 EXISTING FINANCING POSSIBILITIES

Loans

Due to the financial crisis, banks are very strict and loans are rather unfavorable. There is however the possibility to be suspended of payments (e.g. for 1 year). Both of the selected groups ('Young families in dwellings of private houses' and 'Owners/tenants in blocks of flats') have a rather low possibility to obtain favorable loans due to the restrictive system of the banks. There is no specific tax reduction for dwellers when carrying out refurbishment of houses or blocks of flats (either for individuals or for SMEs (managers of the blocks of flats).

Since most of the housing stock in Slovenia was built up after the second World War (some of them were upgraded on the basis old houses or houses from the end of 19th century or beginning of 20th century), most of them are new built up from 1970-1980 (that goes especially for single family houses in suburbs and villages and blocks of flats in the suburbs of the cities). Especially houses built up from 1970-1980 on, have big potentials for savings but due to new regulations and limited funds of the private owner it is not so easy to expect deep renovations, except in cases where the house or block of flats is put on sale. That goes both for young families living in the parents houses and for dwellers (owners and tenants) in multi-story houses.

There is a big interest of both selected segments to improve their houses or flats using the step by step approach (changing of windows, doors, changing of heat systems,..), but also in a long term it is expected that deep renovation will be rather "rare" case due limited own finances, limited public support (20-30 of the whole costs of replacement of windows etc.) and unfavorable loans (mostly 4% based on 3 or 6 months EURLIBOR, average of 20 years).

In the case that the property market will reopen it is expected that the interest for step by step renovation towards deep renovation will increase. However, in Slovenia the real estate market was never very vivid, especially in connection to private housing (last data for 2014: 9.134 sold units (old and new houses) and only 854 flats were sold in 2014).

Additionally, due to increase interest for new CO_2 zero houses and passive houses in the future, "comfort" new houses are expected to be the imperative for owners of older houses to start step by step deep renovation.

6.4 EXISTING SUBSIDIES FOR ENERGY RENOVATIONS

There are two possible ways of getting public funds for renovation of housing stock.

- National level: Eco found calls
- Local level: local communities calls

Box 7.1 Eco fund

Data obtained by Eco fund[20]

Two different options:

- 20-30% of the total investment can be obtained by subsidies for replacement of doors, windows (only wood), energy efficient heating devices (e.g. heat pumps, stoves on wood chips,…), insulation

[20] www.ekosklad.si

of the building envelope . Private person can receive 20-30% of the value of mentioned eligible investment, the same goes for managers of the blocks of buildings.

- favorable loans: heat pumps, insulation of the building envelope, windows, doors, insulation of the roof: The favorable loan can be repaid within 10 years (interest rate EURIBOR + 1,3% fix surcharge).

The ECO fund is a successful instrument, especially subsidies are very popular and are usually sold out. Yearly there is around € 40 M available for either subsidies or loans.

Success factors of the ECO fund:

- A relatively high incentive in the form of grants (up to 25 percent of eligible costs; and up to 50 percent of eligible costs for investments in areas with high PM10 pollution)
- Favourable interest rate (Euribor 3 months + 1.5 percent) compared to the interest rates of commercial banks and the possibility to combine both incentives (grants and soft loans)
- The effective promotion of the Eco Fund's activities among potential investors and providers of the subsidised energy services.

Barriers are as follows:

- Very limited funds for grants and the discontinuity of the public calls. Public calls for grants are not open all year round due to high demand from eligible persons and a relatively small amount of available public funds, raised under the Decree on Energy Savings by End-Users. This results in stagnation in investments, with a negative impact on the economy.

Last data available for Implementation costs in 2014, soft loans: € 30 M[21].

Economic effects (GDP, employment):

Approximately 62,500 investments in buildings, worth a total of € 488 M, for which € 92,3 M in grants were approved for households in the period 2008 to 2013. These investments will result in energy consumption reductions of about 568 GWh/year, CO_2 emissions reductions of 90,000 tonnes/year, and 528 GWh/year of renewable energy use, as well as budget revenues (value added tax) of more than € 41,5 M (including the installation of materials, equipment and devices necessary to perform the investments, but excluding their manufacturing) and work for a few thousand people. Broader positive economic effects, which are hard to assess in financial terms, include the increased use of strategic renewable materials (such as wood), and the adaptation of architecture, engineering and building towards sustainable solutions, which also lead to improved quality and competitiveness.

Box 7.2 En svet counselling – an initiative on national level

On national level EN svet – energy consultancy organizes offers free consultancy for the inhabitants. First This consultancy offers info about possible renovation of houses but unfortunately no in deep information that are needed for step by step or deep renovation. Therefore investors need to find info on the market or at the neighbors or architects or construction companies (semi information, it can happened that they are not up to date or the best info (about materials, prices,...).

[21] (public calls 50PO13, 49OB13 and subsequent calls); grants: € 21.5 M (public calls 24SUB-OB14, 25SUB-OB14, 26SUB-EVOB14, 27SUB-EVPO14); ENSVET project: € 631.000.

Most of the local communities in the region of BSC (18) have decided to support energy efficiency measures in houses. Bigger local communities have yearly calls in sum from € 50.000 to 100.000 (city communities), smaller up to € 25.000. The calls are very similar and have approximately the same measures as on the national level.[22]

Box 7.3 Local support example

Example of asmall community with 4.300 inhabitants: yearly call for energy efficiency measures in private households (overall sum in tender € 25.000) (each investment can be covered in sum max 50% for separate measure).

- for insulation of roof: € 5/m²,
- for insulation of facade: € 5/m²,
- for insulation of ceiling and basement: € 5/m²,
- for replacement of windows and doors € 25/m²
- for solar systems € 125/m² per piece or 1.050 € for whole system
- for heat pumps € 210/per piece
- for special devices for heating (wood) 40% of price or maximum € 1.100 for whole system.

Local support (calls from local communities) has rather low impact since on yearly level only few inhabitants can be helped (due to limited resources of local communities. The subsidies have mainly "empowerment effect and subsidies are role models for the individuals that are planning to implement the investment in energy efficiency with their own funds.

6.5 CHALLENGES AND RECOMMENDATIONS FOR SLOVENIA

6.5.1 Slovenian challenges according to experts

In the preparation of this report two workshops were held of experts in housing economy and energy savings (real estate dealers, bank advisers, financial experts) (one in spring 18.05.2016 and in winter 09.12.2016). (BSC, 2016)

Participants talked about the status for public support and favorable bank loans for deep renovation, challenges and what need to be changed to empower deep energy renovation and make the implementation more popular and effective.

The workshop led to the following definition of challenges:

[22] (own data and local communities web pages:www.zirovnica.si;www.skofjaloka.si;www.kranj.si,…..):

Challenge 1: EPC obligation for all buildings are missing. This will in the long run bring added value and bigger understanding of energy efficiency renovations
Challenge 2: EN svet consulting – need to be significantly improved – more in deep consulting and support
Challenge 3: The regional support system is not sufficient, it needs to be established in counseling (including empowerment of owners of flats and education of the contractors)
Challenge 4: Bank loans are too expensive and too short termed, they need to be redesigned and be more in favor of owners with less demands for mortgage etc. (at least to have less demands for mortgage, insurance and to cut down interests at least to the level of the ECO found).

Additionally, so far contractors and financial sector do not work together (except in the case of managers of multi building houses). Private owners need to find their own way how to finance the energy efficient measures in their dwellings. So far it is hard to expect that construction sector and financial sector will work together but for sure this need to be long term goal for regions and the state.

Additionally, since Slovenia does not have a regional or local support system with focus on guidance at nZEB renovation. The customer cannot get independent advice of how renovation needs to be implemented in a right step by step approach. It should be a long-term project for all regions to start developing efficient regional and local support systems for energy efficiency.

Since the regional support system is not expected to be established in near future and since public buildings are mostly all renewed or are in the process of energy efficiency, there will be the need for energy efficiency measures only in private houses.

If regions and Slovenia will have higher economic growth and banks will become less restrictive, and with favorable loans from banks and higher income of the inhabitants, more people could decide for deep renovation.

6.5.2 Slovenian recommendations for the future

Based on the conclusion of the workshop it can be summarized that in deep renovation needs to become a long term goal of the owners of dwellings, so far it is mainly the goal of the managers of multi storey houses (they are forced to work in that way due to competition from other managers on the market).

- Tax reductions for implemented energy efficiency measures can be recommended
- Local communities need to continue with support measures for households in the field of energy efficiency
- National eco founds need to continue with support measures (not only favorable loans (in cooperation with banks) but also subsidies).

Since most of the houses and flats are privately owned (91%), it can therefore be expected that energy renovation will be based on the need for lower costs and more comfort living and less on the opportunities of higher market prices of refurbished houses or flats (mostly people do not sell their houses or flats, just in the case of movement or in the family necessity (lack of funds,…).

Owners of the dwelling represent the important part of the housing stock and based on their decisions step by step renovation should become more “common”. At the moment, there are only a few first mowers that have carried out nZEB renovation.

In Slovenia the banking system or public support measures are not expected to be changed very quickly. Subsidies will get lower and at the final stage only favorable loans from the national Eco found will continue. Therefore, it is not realistic to plan changes in behavior of segments based on the existing support measures.

Since the financial sector and the building sector do not really cooperate (especially regarding energy efficiency measures for private houses), time is needed to move the financial and building sector into the right direction. Therefore, without a national scheme or national support this might not happen in a very short time. The ECO fund should try to work with banks on the long-term system in which banks will demand less insurance and lower interest rates for loans.

Since En Svet Consultancy is a national initiative and the regions resources are limited, it is recommended to further develop "En Svet General Consultancy", so they can offer a good guidance for step by step nZEB renovation. In addition, national tax reductions should be implemented for owners of buildings for energy efficiency measures. That would be beneficial for the state – better housing stock (less CO_2 emissions) and for the building market (more business).

Literature Slovenia

SLO, 2017: National legislation in Slovenia regarding energy efficiency (general data used as the starting point)

EKO, 2017: www.ekosklad.si

LOCAL, 2017: web pages of 3 local communities in the region

SURS, 2017: national statistical office: www.surs.si

COMBINES; 2017: http://www.combines-ce.eu/ (EU project describing energy efficiency measures) starting point for the

BSC, 2016: Workshop with financial experts,

EURIBOR, 2017: Euro Interbank Offer Rate - EURIBOR Definition | Investopedia http://www.investopedia.com/terms/e/euribor.asp#ixzz4Za6vfNdm

7 Summary of the countries

In the six REFURB countries, there are a number of financial stimuli to reward homeowners when they conduct nZEB renovation. This can be **coaching, grants and subsidies** for individual energy-efficiency related renovation measures of the building envelope or the technical installations. Another option is **tax stimuli** such as tax deduction for selected renovation measures (Denmark) or tax reduction on property (Belgium, Flanders) in case of achieving a certain energy efficiency level with the renovation.

7.1 MACRO-ECONOMIC TENDENCIES

Financial differences between the six REFURB countries are important in order to understand the economic challenges in each country, but also in order to assess which financing options can actually work in renovation packages in each of the countries. In Annex a number of economic data from OECD are listed. Below is a short summary of the most important differences between the six countries.

- **Income/GDP**: Eastern Europe has inconsistent income, lower income/GDP
- **Debt:** Homeowners in the Netherlands and Denmark have more debt than other countries, banks are willing to take risks (good loan conditions)
- **Interest rate**: The short-term interest rate is following the same guidelines from the European Central Bank. Slovenia has a higher interest rate than other countries
- **The employment rate:** Belgium has a rather low employment rate compared to other European countries
- **Savings:** Germany, Slovenia and the Netherlands have higher savings than the other countries

7.2 SINGLE FAMILY HOMES

Within this section the financial mechanisms, challenges and recommendations are summarized per customer segment.

7.2.1 Coaching, grants and support for single family homes

In Germany, the Netherlands, Belgium and Denmark the characteristics for coaching and grants supporting energy refurbishment in single family homes are listed in Box 8.1.

Box 8.1 Financial stimuli: coaching stimuli, grant and grants for single family homes in Denmark, the Netherlands, Belgium and Germany

Denmark: In 2017, there are active several training programs for energy coaches, two minor national one stop shop offers (Better Home, Better Housing). Several local energy network/local energy coaching offers as Project Zero (Soenderborg), Green Business Growth (6 cities). A total grant of 2-3% on the total energy renovation investment can be obtained through 2 sources.

1. Tax deduction on the man-hour cost for energy renovation
2. Selling the energy saving to an energy supply company.

The Netherlands: In 2017, Stroomversnelling is a large-scale scheme for coaching for zero energy

renovations in the Municipality of Leeuwarden, which includes renovation plans/guarantee coaching for nZEB.

Belgium (Flanders): Subsidies for individual renovation measures, with bonuses when part of an integrated nZEB renovation; grants for "nZEB-coache service" (called the "neighbourhood grant" when they support a collective renovation process of minimum ten individual homeowners; and a property tax reduction for deep energy renovation[23].

Germany: Effective grants from KfW bank, up to € 30.000, energy renovation and up to € 4.000 for consultancy leading to an Energy Efficient house (ZUSHUSS 43 AND 431)

To summarize, Denmark counts with several training programs for energy coaches and energy check-ups, a low grant and subsidy system, where the Netherlands and Belgium (Flanders) both have schemes for coaching and for zero energy renovations. Germany is characterized by a very organized and large grant for both energy renovations and consultancy.

Box 8.2 lists the loan opportunities for single family homes in Denmark, the Netherlands, Belgium and Germany.

Box 8.2 Loan opportunities for single family homes in Denmark, the Netherlands, Belgium and Germany

Denmark: Private loans, long mortgage loans with a low interest rate, >€ 20.000-100.000 (30 years and 1-2% interest rate), combined with 10-20 years bank loans < € 20.000 with 3-6% in interest rate. 5% self-financing

The Netherlands: Private loans with raised mortgage for energy performance guarantee, > 10 years, € 27.000-34.000, 1-2% lower than the standard, 5 % interest rate. Energy saving loan, up to € 25.000, 15 years, 2,8 % interest rate. Property linked loan/ ESCO model. The investments are paid by energy savings. Leasehold/service costs loans linked to private housing association (Assen). Public loans in the Municipality of Leeuwarden. For homes with a value of less than € 250.000, energy saving loans up to € 7.500

Belgium (Flanders): Specific examples of soft loans: private renovation loan for House Owner Associations, Antwerp, 2016 (lower interest rates than for private homeowners). Specific example of revolving funds: Community Land Trust tool, (loan to low-income households (paid back when sold), Ghent, 2015. Duwolim Plus, the renewed Renovation loan from the Province of Limburg

Germany: Private special bank loan for renovation or modernisation, 1-2%. Big public KfW-scheme for loans up to € 100.000 (1-2% kfW-loan; 0,75%, repayment grant). The 'Effizienzhaus'-standard after refurbishment, defines the repayment grant back (5-15%) Kredit 1667, up to € 50.000 for heating systems, 10 years, 1,11% interest rate .

To summarize, Germany stands out with a very effective grant, subsidy and loan system, where the conditions are far better than in the other countries and where the results are very positive (230,000 dwellings, 514,000 tons CO_2 saved, energy saving € 155 M/year). However, it is recommended that the

[23] In Flanders, this corresponds with a deep energy renovation (in Dutch: "Ingrijpende Energetische Renovatie"), which achieve an E-level of E60. E-level is the energy efficiency indicator resulting from the regional EPBD-calculation.

conditions for achieving a certain energy standard should be lower in order to attract more homeowners to the program. Denmark´s characteristics are long private 30 years mortgage loans and a very low interest rate. The Netherlands and Belgium both have a number of private and public 10-20 years loans supporting energy renovation.

7.2.2 Financial challenges for single family homes

The financial challenges are very different in the four countries. They are summarized in Table 12.

Table 12 Financial challenges in Denmark, Belgium, Germany and The Netherlands for single family homes

Country	Challenges
Denmark	1. The valuation of houses are not updated by law and does not include the energy standard 2. Attractive packages of energy renovation offers for the end customer are missing 3. The finance sector is not given authority to require professional energy checks- up as a condition for an energy loan and have too little knowledge about the advantages of energy renovation 4. The subsidies and fiscal instruments are very low and limited
Belgium (Flanders)	1. The need for pre-financing: Renovations up to nZEB level require a high upfront investment. 2. Orienting the energy renovation investments, with sufficient attention for other housing aspects such as living quality 3. The need for financial resources for unburdening and counselling of dwellers for the preparation and implementation of energy saving investments 4. A higher deployment of fiscal instruments to stimulate energy saving investments
Germany	1. House owners often decide against deep renovation and go for single measures or a stepwise approach 2. EPC (‘Energieausweis‘) needs further improvements to be trusted 3. Technical potentials and funding need to be tapped in practice 4. Transparency is the first step towards taking action 5. The customer’s needs should be paramount and in focus
The Netherlands	1. Loan to value is a still a relatively new type of arrangement to stimulate nZEB renovation. 2. There is a level of uncertainty whether the theoretical estimation of the amount of energy saved due to nZEB renovation will actually be reached in practice. 3. The payback period for nZEB renovation is still very long. 4. The amount of money that needs to be invested for nZEB renovation to be carried out to full extent is considerable. 5. Financial institutions are hesitant to provide loans for nZEB renovation for individual homeowners as they consider this to be a high risk financial product

To summarize, existing fiscal regulations and subsidies seem not to be sufficient and ambitious enough to really convince homeowners to renovate their home to nZEB-level. nZEB renovations should be de-risked to stimulate investments from banks and financing institutions. Banks and financial institutions neither offer pre-financing nor cooperation with the energy advisers on a long term energy renovation plan. The amount of money to be invested is considerable. The EPC needs further improvements to be trusted and therefore the full effect of EPC is still not seen. The regulation for valuation of houses is not updated and does not

include energy improvements. There is a lack of attractive and transparent packages solutions where health, comfort esthetic and the costumers needs are in focus.

Based on these challenges each country has national recommendations.

7.2.3 Financial recommendations for nZEB renovation in single family homes

Fiscal regulations and subsidies

If nZEB shall be reached, there is a need for much stronger fiscal regulations and subsidies like the one seen in Germany by the public bank, kfW. There good loans with low interest rate and grants can be provided, if documented that a certain energy standard is achieved. However, it is recommended to regulate the conditions since there is a need for both implementing energy savings related to the easily achieved low hanging fruit and the more costly nZEB renovation

Furthermore, in Denmark, because of low energy prices, there is a decreasing interest for energy renovation that is not seen in the other countries. There is a need for more focus on implementing some of the many recommendations in the Danish energy renovation strategy plan to achieve the EU recommended nZEB standard.

This can be tax deduction on property, as seen in Flanders, where home homeowners are rewarded for achieving planned energy renovation. On the long term, it is recommended that housing taxation should be based on energy performance and living quality (possibly along with other criteria).

Financial construction of packages with focus on health, comfort, esthetic

Financial unburdening of the homeowner, giving them an overview of the possibilities, are recommendations especially for the Netherlands and Belgium; a point to consider, when composing the renovation packages within REFURB. Especially more incentives for young families are needed since they are challenged the most when buying a house. The development of new business models for innovative support mechanisms, such as guarantee funds, Energy Performance Contracting, renovation cooperatives, crowdfunding initiatives should be considered.

The subject of finance cannot be seen as a ‘stand-alone solution’. Clearly quality assurance has to be provided from the building industry and the homeowners need to have access to affordable financing and quality guarantees.

Loans and mortgages

There is a need for bank/mortgage loans combining cheap energy loans on the condition of energy consultancy or standards. Furthermore, this technical support can be an integrated part of the financing scheme. For instance, energy audits as a prerequisite to benefit from financial loans or the technical support funded through the financial program.

It should be allowed for the bank adviser to set conditions such as an energy check-up, to secure that the loans granted are well invested and that energy savings are prioritized.

More effect of EPC and regulation of valuation of houses

Surveys among real estate agents strongly indicate that the EPC can be improved to further stimulate its effect on house pricing. Improvements can relate to making the EPC and the expected benefits more visually understandable, providing cost information of renovation measures and expected energy savings and showing the relation between the simulated energy score and the actual energy consumption.

Also a common standard for value estimation of houses including energy performance is a central element that could push the market and the demand for nZEB renovations. There is a need for an update on the regulations about value estimation of houses reflecting the energy standard.

7.3 MULTIFAMILY HOUSES

7.3.1 Coaching, grants and support

Box 8.3 lists the coaching, grant and support initiatives in Estonia and Slovenia for multifamily houses

Box 7.3 Coaching, grant and support stimuli for multifamily houses in Estonia and Slovenia

Estonia: On national level 'En Svet General Consultancy' organizes offers free consultancy for the inhabitants Apartment associations who could rely on KredEx for technical assistance as well as help with energy audit grants, or guarantees covering up to 35% of their renovation costs, 2016. The program will end in 2020.

Small residential buildings can receive up to 30% of the total cost of reconstruction with the maximum grant amount at € 15.000.

Slovenia: Eco Fund: 20-30% of the total investment can be obtained by subsidies for renovation (subsidy for both private persons and mangers of blocks).

To summarize, Estonia and Slovenia offer grant possibilities (25-35%) which are not seen in any of the other REFURB countries. However it is likely that the grant system will not continue after 2020. In Estonia, more than 500 multifamily houses with 1,4 million m² were renovated as a result of the Kredex program for energy renovation. In Slovenia, approximately 62.500 investments in buildings, worth a total of € 488 million were approved for households in the period 2008 to 2013.

Box 7.4 Loan systems supporting energy renovation in multifamily houses in Estonia and Slovenia

Estonia: Private mortgage loan: 80%, over € 7.000, grace period. Private renovation loan: 20 years, Euribor rate, normally 3%, together with applying for grant. Public KredEx loan: For building associations, 75% of the amount, 1,2-1,7%

Slovenia: Eco fund loans: favorable loans for energy renovation and heat pumps. Repayed within 10 years (interest rate EURIBOR + 1,3% fix surcharge).

To summarize, Estonia and Slovenia are characterized by private loans no longer than 10-20 years, but attractive public loans (KredEx loans and Eco fund loans) with low interest rate.

7.3.2 Financial challenges for multifamily family houses

The countries have highlighted 4-5 mayor financial challenges that are barriers to get a real demand for nZEB energy renovation related to multifamily houses. An overview is shown in

Table 13.

Table 13 Financial challenges for multifamily houses in Estonia and Slovenia

Country	Challenges
Estonia	**1.** Ability (or lack) of Housing associations to apply the loan for renovation and to service it. **2**. Exhaustion of subsidies. The funds for current renovation subsidies were calculated to last up to 2020. **3**. The lack of initiative from the housing associations
Slovenia	1. EPC obligation for all buildings are missing. 2. EN svet consulting – need to be significantly improved – more in deep consulting and support 3. The regional support system is not sufficient, it needs to be established in counseling 4. Bank loans are too expensive and too short termed

To summarize, Estonia and Slovenia have agreed that subsides, advice and lack of fiscal regulations are the biggest financial challenges for nZEB refurbishment in multifamily houses.

Subsidies: The large scale EU- financial programs for supporting energy renovation might disappear in 2020.

Knowhow/advice: The housing association shall be able to apply for the loan and service it. Energy advising in multifamily houses can be a challenge, because the multifamily houses consist of private apartment owners and there need to be a majority voting for action to implement energy renovation.

Lack of fiscal regulations: More regulations are needed to stimulate nZEB renovation because of low income of the inhabitants and a careful bank sector. The housing associations lack initiative and poor financial discipline affects qualifying for collateral. There is a need for banks to take more risks and provide long term loans and low interest rate, if reaching for nZEB renovation.

7.3.3 Financial recommendations for nZEB renovation in multifamily houses

The two countries have different national recommendations for the future. However they can agree on the following recommendations:

Subsidies, keep the well-functing EU-programs

KredEx (Estonia) and national Eco fond (Slovenia) with 25-35% subsidy

Different scenarios can be set up for implementing energy renovation. As for the future –there is no other plan or proposal than keep using the KredEx program and the Eco fund program, as long as there are financing possibilities. These programs have neither been negotiated nor adopted by the parliament. The subsidy program is not a financial measure but foremost social. All financial and conditions are not negotiable.

Further develop and support local energy advice programs

The regional support system needs to be established in counseling (including empowerment of owners of flats, education of the contractors and consulting). Local communities need to continue with supporting energy measures. It is recommended to further develop energy advising ex. “En Svet General Consultancy” in Slovenia, so that they can offer a good guidance for step by step nZEB renovation.

Further develop fiscal regulations

It is recommended to implement national tax reductions for owners of buildings for the implementation of energy efficiency measures. That would be beneficial for the state – better housing stock (less CO_2 emissions) and for the building market. Regulation from the government are needed to empower more financial discipline.

Provide attractive loans

If regions would have higher economic growth and banks would become less restrictive, with favorable loans from banks and higher income of the inhabitants more people would decide for deep renovation. Therefore, a suggestion is made that ECO fund and KredEX to try to work with banks on a long-term system in which banks would demands less insurance and lower interest rates for loans.

7.4 ENERGY PERFORMANCE CERTIFICATES (EPC) AND REAL ESTATE VALUE

Table 15 presents an overview of the impact of the energy performance (as indicated on EPC) on the real estate value of residential property.

Table 14: Overview of EPC effect on prices and value securing

Country	*EPC effect on price level*
Denmark	€ **7.000 extra value** of the single family house for **each step up the EPC ranking**. G label homes had a € **21.000 lower value compared to an average D label home.**
Belgium (Flanders)	A national study indicated a decrease of 0.75% of the selling price of a single family house in case the energy-score increased with 10%. A European study of the Flemish building stock showed that an improvement of 100 kWh/m² in the energy score corresponds with a 4.3% higher price, on average, while an improvement of 100 kWh/m² in the energy score is associated with a 3.2% higher rent
Germany	**Not yet existent**
The Netherlands	**G label homes were € 16.000 less in value than average**, An A label home has a higher value of € 6.000, compared to an average EPC label
Estonia	**Not yet** publicly acknowledged. Calculations estimate the prices to be 5-15% higher
Slovenia	**Too soon** to see an effect, EPC in 2015. Calculations show sale prices up to 22% higher

To summarize the table shows that Denmark and the Netherlands both seem to have significant impact of the energy efficiency on house prices as G label homes were € 16.000 – 21.000 less valued than an average D-labelled house. In Flanders there is also 3.2-4.3% higher rent/price for a good energy labeling, where the effect is still not seen in Germany, Estonia and Slovenia.

8 Innovative financial schemes in other countries

There are already a number of innovative financing schemes, which are piloted in certain Member States in Europe. An overview of innovative financing schemes is provided in Table 15**Error! Reference source not found.**.

The challenge is to identify the financial constructions with the largest potential, more in particular to which extent they could be integrated in the renovation packages that will be developed within REFURB.

Table 15: Overview of innovative financial schemes (source: [CoM, 2014])

Scheme	Brief description
Energy Performance Contracting (EPCo) with third party investment	EPCo is a contractual arrangement between a beneficiary and an Energy Service Company (ESCO) about energy efficiency improvements or renewables installations. Normally an ESCO implements the measures and offers the know-how and monitoring during the whole term of the contract. Essentially the ESCO will not receive its payment unless the project delivers energy savings/production as expected
Revolving loan funds	A revolving loan fund is a source of money from which loans are made for multiple sustainable energy projects. Revolving funds can provide loans for projects that do not have access to other types of loans from financial institutions, or can provide loans at a below-market rate of interest (soft loans).
Soft loans	Soft loan schemes are loans with below market rates and longer payback periods
Loan guarantees	Loan guarantees provide buffers by first losses of non-payment
Portfolio guarantees	Portfolio guarantees reduces the risks of payment delays, so reduces the overall costs of financing (solid protection from later payments).
On-bill financing	Energy suppliers collect the repayment of a loan through energy bills. It leverages the relationship, which exists between a utility and its customer in order to facilitate access to funding for sustainable energy investments
Crowd-funding / community funding	Pooling resources of different actors, utilizing most of the time an internet-based platform. This can happen in combination with energy cooperatives.
Green Municipal Bonds	Local government (or their agencies) can issue green bonds to fund their sustainable energy projects. A green bond can operate as a normal bond, which is a debt that will be paid back, depending on the characteristics of the bond, with interest. These can be made attractive via tax-exemptions.

A good example of how this could look like in practice is the implementation of the Pass Rénovation, which is applied in the Picardie region in France. This best practice can serve as inspiration to empower and finance nZEB renovation. The program makes use of the ELENA fund from the European Investment Bank (see Box 9.1).

Box 9.1 Picardie and Elena fund funded by the European investment Bank

Pass Rénovation Picardie

ELENA ("European Local ENergy Assistance") is there to support EU municipalities and regions when lack the necessary technical expertise and organizational capacity to implement large energy efficiency and renewable projects, such as regional housing renovation programs. The challenge of such projects is to provide value for money and to secure funding. The ELENA-fund is run by the EIB (European Investment Bank) and it is funded through the European Commission's Horizon 2020 program.

ELENA covers up to 90% of the technical support/adviser cost needed to prepare the investment program for implementation and financing. ELENA helps local authorities to get their projects on the right track and make them bankable, whether it is for retrofitting or integrating renewable energy in public and private buildings, energy-efficient district heating and cooling networks or innovative, sustainable and environmentally-friendly transport systems.[24]

The French region "Picardie" has an ELENA-project, for the Renovation program "Pass Rénovation Picardie". The ambition is to renovate 10.000 dwellings per year, amongst which 3.000 collective renovations. The focus of the program is on deep renovations (at least 3 renovation measures).

Picardie Pass provides own loans, and loans from the European Investment Bank through the Elena-facility. The goal is to realize 100 million of investments on the field. Loans are provided to homeowners for 2%. The targeted segment are dwellings constructed before 1982, ideally with energy bill of € 240 per month (which corresponds with € 2.880 per year). On an average, € 40.000 per household is borrowed. Half of the money must be refunded through energy saving in a period of 25 years. The goal is to reduce the homeowner energy bill with 40%

Pass Rénovation Picardie has set-up a kind of a "public service", a special legal entity to provide the loans. The system needs 1.000 loans per year to be cost-efficient. 23 renovation coaches guide the homeowners. The homeowner pays € 1.800 for the guidance. The guidance is obligatory for getting the loan. The amount of € 1.800 is a fixed price, also for smaller works, but it is lower than the real cost/price. It can be paid in steps, or per month. It includes: The composition of a personal renovation plan, support in selection and follow-up of contractors (approximately 60 hours per case spent on coaching). From the people that initially showed interest via phone contact, more or less half of them were visited by renovation coaches, with in the end approximately 25% finally deciding to continue with a renovation. The goal is to reduce energy costs with 40%. This is monitored through energy bills and energy consumption (in-depth financial analysis). This target is achieved for the majority of the cases, nevertheless in some cases energy costs are reported to by increased after the renovation.[25]

[PASS, 2016]

[24] http://www.eib.org/attachments/documents/elena_faq_en.pdf

[25] Every Elena-case is different. See also http://www.eib.org/attachments/documents/elena_faq_en.pdf.On average: € 40.000 per case (intermediate evaluation). Loan of European bank at 1.7% for 25 years (€ 23,5 M).Total budget € 63 M (€ 55 M for renovation works; € 8 M for implementation costs). Investments include not only energy efficient investment, but sometimes also comfort improvements (kitchen, bathroom...).

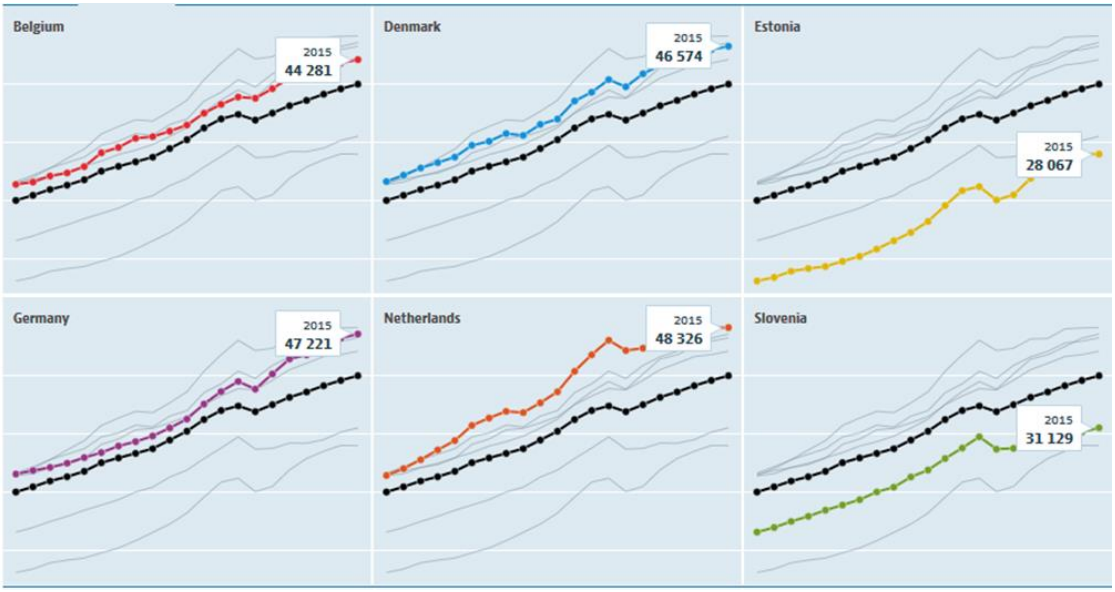
Annex: General macroeconomic factors of the six REFURB countries

A mapping of economic data from the OECD shows that there are big differences between Western and Eastern countries. The macro economic data gives an understanding of the financial frame conditions and the challenges, that each country are dealing with in order to stimulate the market for nZEB renovation. Because of the differences, the political recommendations to high-level policy makers have to be different from country to country. This insight can be usable as a background for constructing locally designed renovation packages.

- **Income/GDP**: Eastern Europe has inconsistent income, lower income/GDP
- **Debt:** Homeowners in the Netherlands and Denmark have more debt than other countries, banks are willing to take risks (good loan conditions)
- **Interest rate**: The short-term interest rate is following the same guidelines from the European Central Bank. Slovenia has a higher interest rate than other countries
- **The employment rate:** Belgium has a rather low employment rate compared to other all countries
- **Savings:** Germany, Slovenia and the Netherlands have higher savings than the other countries

Below general macroeconomic factors in the REFURB partner countries Belgium, the Netherlands, Denmark, Germany, Estonia and Slovenia are listed. The illustrations are based on economic data from OECD.

Figure 1 Total, US dollars/capita, 1995 – 2015 Source: Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product



Key issue:

The East European countries have a lower GDP than the Western countries.

Box 1.1 Definition of Gross domestic product (GDP)

Gross domestic product (GDP) at market prices is the expenditure on final goods and services minus imports: final consumption expenditures, gross capital formation, and exports less imports. "Gross" signifies that no deduction has been made for the depreciation of machinery, buildings and other capital products used in production. "Domestic" means that it is produced by the resident institutional units of the country. The products refer to final goods and services, that is, those that are purchased, imputed or otherwise, as: final consumption of households, non-profit institutions serving households and government; fixed assets; and exports (minus imports). Data are internationally comparable by following the System of National Accounts. This indicator is measured in USD per capita (GDP per capita) and in million USD at current prices and PPPs. Data are under 2008 System of National Accounts (SNA 2008) for all countries except for Chile, Japan and Turkey (SNA 1993).

Fig. 1.2 Household disposable income - Net, Annual growth rate (%), 2000 – 2015

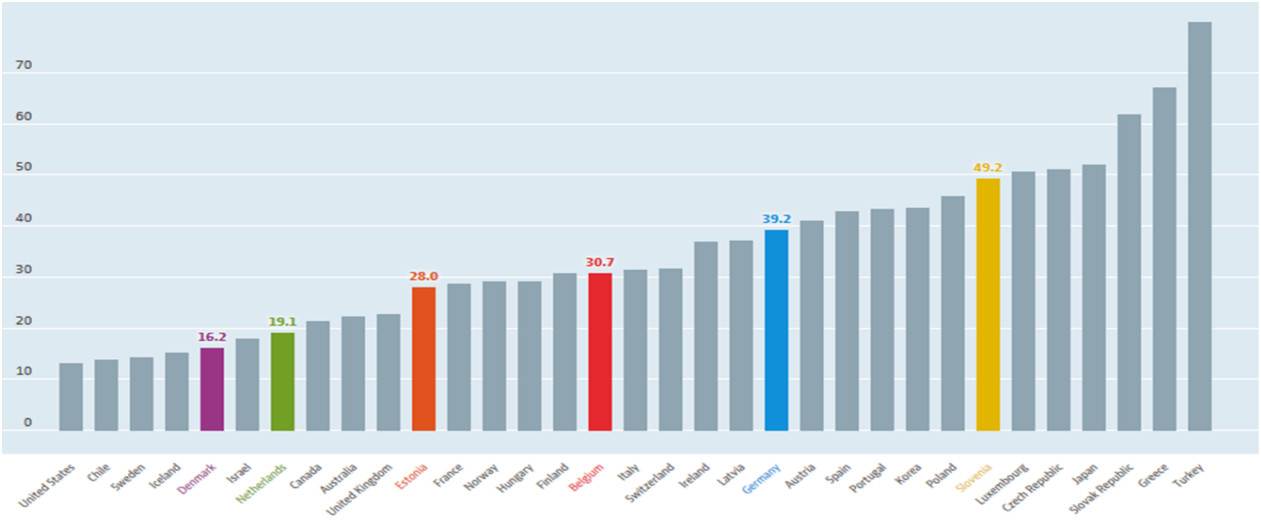
Key issue:

The East European countries have a more inconsistent income than the other countries.

Box 1.2 Definition of Household disposable income

Real household net disposable income is defined as the sum of household final consumption expenditure and savings, minus the change in net equity of households in pension funds. This indicator also corresponds to the sum of wages and salaries, mixed income, net property income, net current transfers and social benefits other than social transfers in kind, less taxes on income and wealth and social security contributions paid by employees, the self-employed and the unemployed. Household gross adjusted disposable income additionally reallocates "income" from government and non-profit institutions serving households (NPISHs) to households to reflect social transfers in kind. These transfers reflect expenditures made by government or NPISHs on individual goods and services, such as health and education, on behalf of an individual household. The indicator includes the disposable income of non-profit institutions serving households. Disposable income, as a concept, is closer to the idea of income as generally understood in economics, than is either national income or gross domestic product (GDP). This indicator is measured in terms of net in annual growth rates and in terms of gross adjusted in USD per capita at current prices and PPPs. Data are under 2008 System of National Accounts (SNA 2008) for all countries except for Chile, Japan and Turkey (SNA 1993).

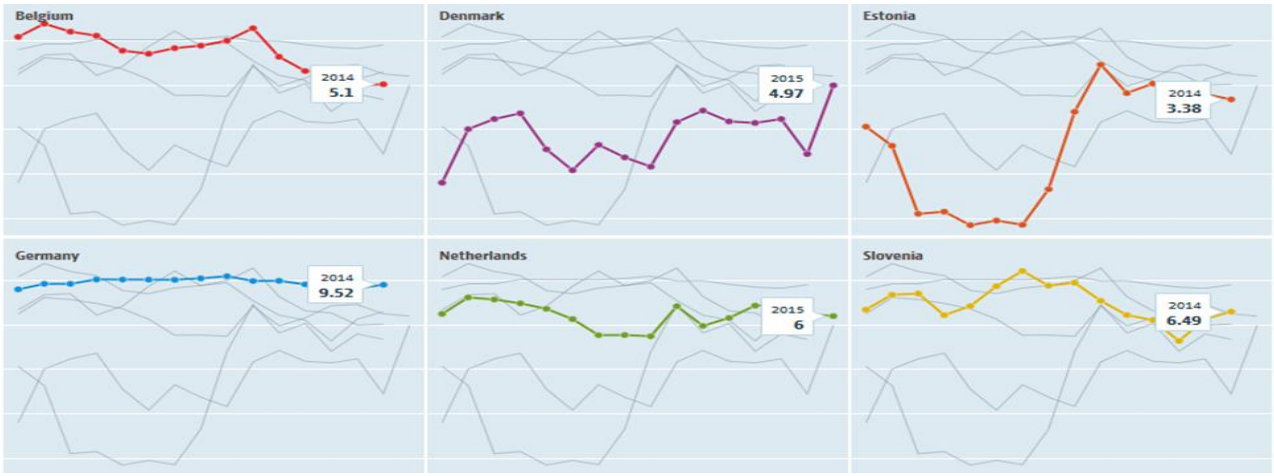
Fig. 1.3 Household financial assets - Currency and deposits, % of total financial assets, 2014



Key issue:

Differences between the countries are significant.

Fig. 1.4 Household savings - Total, % of household disposable income, 2000 – 2015



Key issue:

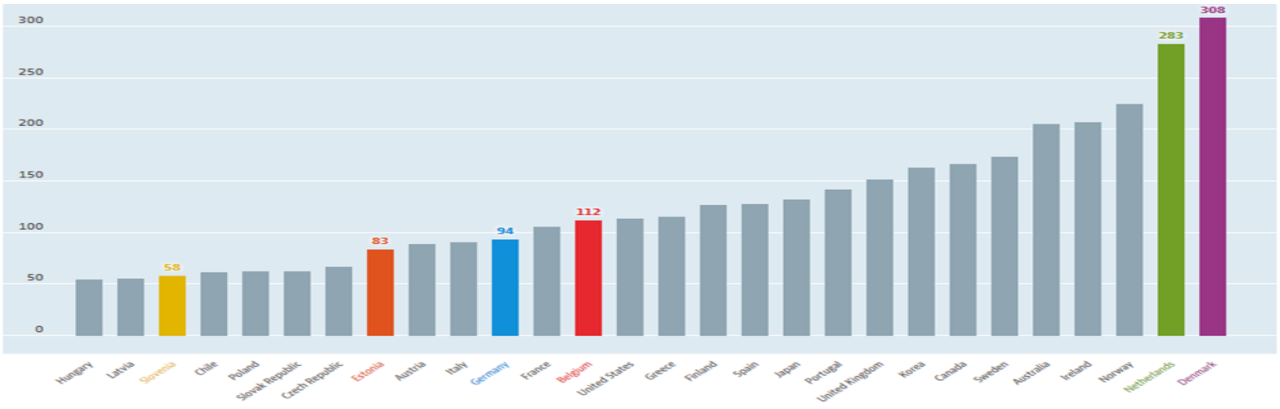
Germany, Slovenia and the Netherlands have a higher household saving.

Box 1.4 Definition of Household savings

Net household saving is defined as the subtraction of household consumption expenditure from household disposable income, plus the change in net equity of households in pension funds. Household saving is the main domestic source of funds to finance capital investment, a major impetus for long-term economic growth. This indicator is measured as a percentage of household disposable income. Data are under 2008 System of National Accounts (SNA 2008) for all countries except for Chile, Japan and Turkey

(SNA 1993).

Fig. 1.5 Household debt - Total, % of net disposable income, 2014



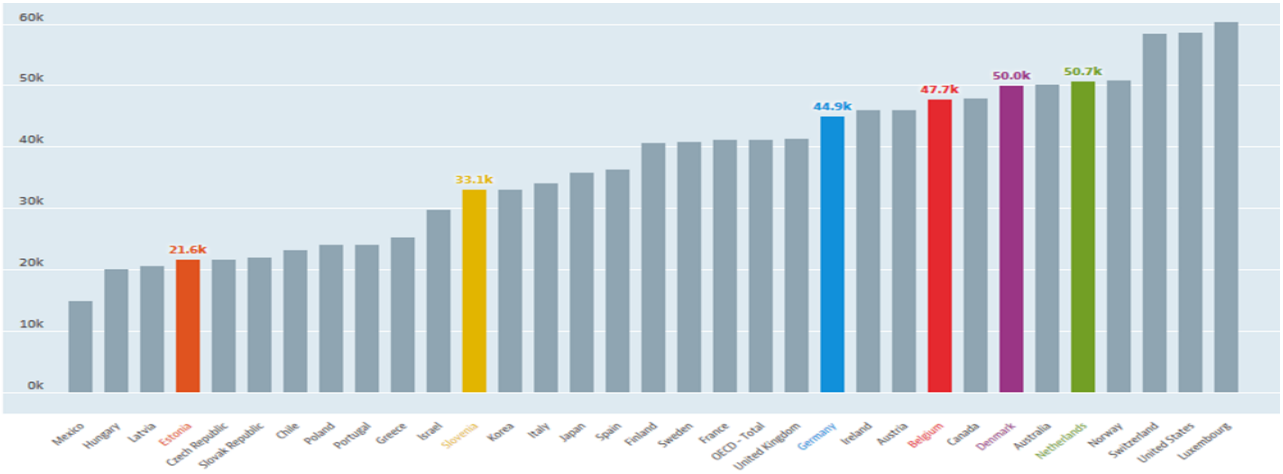
Key issues:

The Netherlands and Denmark have significantly more debt compared to the other countries.

Box 1.5 Definition of Household debt

Household debt is defined as all liabilities that require payment or payments of interest or principal by household to the creditor at a date or dates in the future. Consequently, all debt instruments are liabilities, but some liabilities such as shares, equity and financial derivatives are not considered as debt. According to the 1993 System of National Accounts, debt is thus obtained as the sum of the following liability categories, whenever available/applicable in the financial balance sheet of the households and non-profit institutions serving households sector, such as: currency and deposits; securities other than shares, except financial derivatives; loans; insurance technical reserves; and other accounts payable. For households, liabilities predominantly consist of loans, in special mortgage loans for the purchase of houses. This indicator is measured as a percentage of NDI. Data are under 2008 System of National Accounts (SNA 2008) for all countries except for Chile, Japan and Turkey (SNA 1993).

Fig. 1.6 Average wages - Total, US dollars , 2015



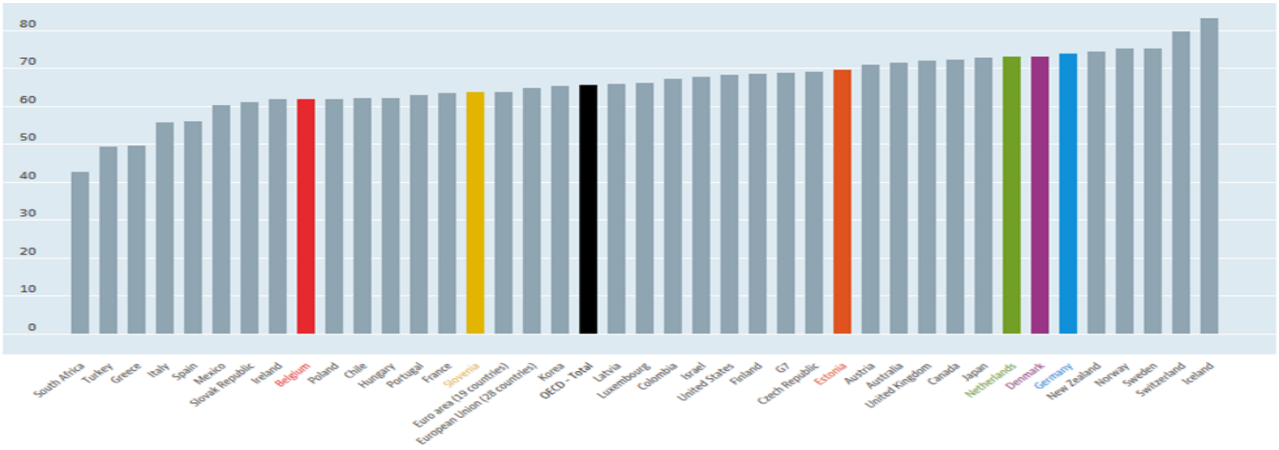
Key issues:

The Eastern countries have a significant lower average income than the Western countries.

Box 1.6 Definition of Average wages

Average wages are obtained by dividing the national-accounts-based total wage bill by the average number of employees in the total economy, which is then multiplied by the ratio of the average usual weekly hours per full-time employee to the average usually weekly hours for all employees. This indicator is measured in USD constant prices using 2012 base year and Purchasing Power Parities (PPPs) for private consumption of the same year.

Fig. 1.7 Employment rate - Total, % of working age population, Q3 2014



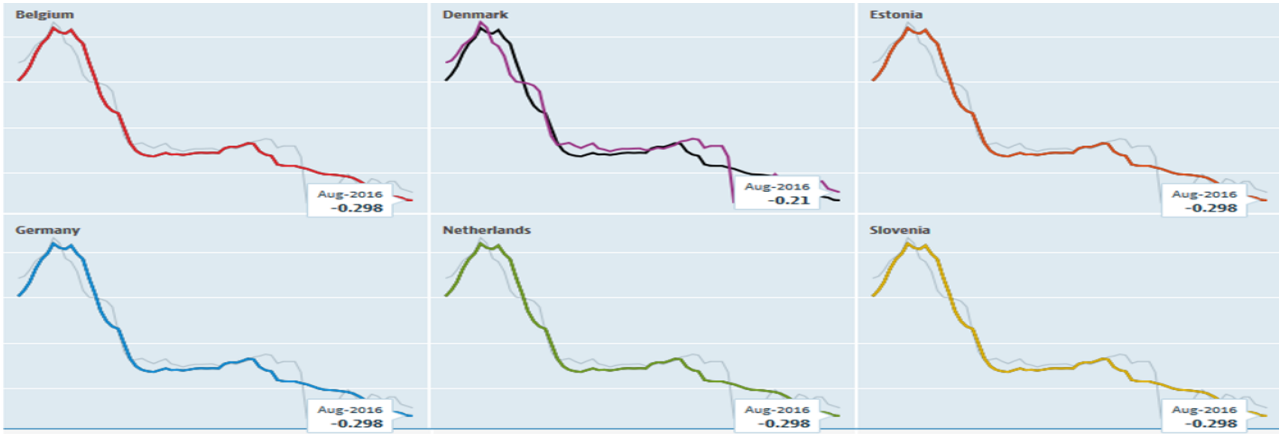
Key issues:

Belgium stands out from the other Western countries.

Box 1.7 Definition of Employment rate

Employment rates are defined as a measure of the extent to which available labor resources (people available to work) are being used. They are calculated as the ratio of the employed to the working age population. Employment rates are sensitive to the economic cycle, but in the longer term they are significantly affected by governments' higher education and income support policies and by policies that facilitate employment of women and disadvantaged groups. Employed people are those aged 15 or over who report that they have worked in gainful employment for at least one hour in the previous week or who had a job but were absent from work during the reference week. The working age population refers to people aged 15 to 64. This indicator is seasonally adjusted and it is measured in terms of thousand persons aged 15 and over; and as a percentage of working age population

Fig. 1.8 Short-term interest rates - Total, % per annum, Jan 2011 – Aug 2016



Key issues:

Interest rates are approximately the same due to the relation to the ECB.

Box 1.8 Definition of Short-term interest rates

Short-term interest rates are the rates at which short-term borrowings are effected between financial institutions or the rate at which short-term government paper is issued or traded in the market. Short-term interest rates are generally averages of daily rates, measured as a percentage. Short-term interest rates are based on three-month money market rates where available. Typical standard names are "money market rate" and "treasury bill rate".

Fig. 1.9 Long-term interest rates - Total, % per annum, Jan 2007 – Aug 2016

Key issue on this:

Slovenia hasa much higher long-term interest rate than the other five countries.

Box 1.9 Definition of Long-term interest rates

Long-term interest rates refer to government bonds maturing in ten years. Rates are mainly determined by the price charged by the lender, the risk from the borrower and the fall in the capital value. Long-term

interest rates are generally averages of daily rates, measured as a percentage. These interest rates are implied by the prices at which the government bonds are traded on financial markets, not the interest rates at which the loans were issued. In all cases, they refer to bonds whose capital repayment is guaranteed by governments. Long-term interest rates are one of the determinants of business investment. Low long-term interest rates encourage investment in new equipment and high interest rates discourage it. Investment is, in turn, a major source of economic growth.