Deliverable D3.1 Mapping demand side drivers according to supply side

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Contents

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1.0	01/12/2015	bostoen	Report to VITO
1.1	01/12/2015	VITO	Final edit by VITO
1.2	04/12/2015	bostoen	Corrected report to VITO
2.0	07/12/2015	VITO	Final report

Summary

Renovation by the private sector towards increased energy efficiency is seriously lagging behind. As more than sufficient technological solutions are available, focus must be on removing non-technological barriers. The main barriers in the residential sector relate to fragmentation of the renovation offer, resulting in inefficient or only partial solutions. In addition to financial restrictions and unclear benefits, homeowners do not have a structured way to obtain all the necessary information. One way to solve this is the use of a '1-stop-shop concept'. Many have been put in practice. Some were successful, others not. They often lack an understanding of the concerns and demands of homeowners.

The REFURB project focuses on the complex interplay of barriers through coordinated process organization, innovation and optimization. This way the REFURB project will bridge the gap between supply and demand sides. Therefore, WP2 and WP3 are dedicated to analyze demand and supply-side drivers.

This report is part of WP3 ('supply side mapping') that focuses on the supply side. The supply side involves suppliers of technologies or technological solutions such as insulation and renewable energy solutions, like contractors, architects and other advisors which target the demand side. In WP 3 the view of the supply side on the demand side and the already known solutions will be mapped. These objectives will be realized in three different deliverables. This report D3.1 is about understanding how the supply side perceives the demand drivers and to define the problem of mutual understanding.

The REFURB project focuses on renovation of dwellings to Nearly Zero Energy Buildings (NZEB) through (staged) deep renovations. The homeowners can be either living in their own dwelling (owner-occupant) or let their dwelling to a tenant. The final research question of the REFURB project is: How to stimulate private homeowners (and co-decision makers, like tenants) to renovate their dwelling to NZEB?

To resolve this question, this report identifies **what is driving homeowners to renovate their dwelling(s) to NZEB in in the eyes of the supply side?**

Actually, both **drivers** and **barriers** have to be researched. As drivers are positive arguments for homeowners to renovate to NZEB, barriers are negative arguments for homeowners to renovate to NZEB. These barriers can be important obstacles to overcome before one can start using drivers to stimulate homeowners to renovate to NZEB. Nevertheless, a driver can also become a barrier in certain circumstances.

REFURB partners of all countries involved gathered existing studies, advertisements (internet, catalogues, information from technical fairs…) of the supply side to the demand side and eventually made new surveys to determine the demand-side drivers according to the supply side in their country.

Out of these results the **general categories** for the demand-side drivers according to the supply side were determined. Seven general categories of demand-side drivers according to the supply side are determined out of the input of all partners:

- Comfort in living
- Comfort in process
- Technologies
- Guarantee for supply side

- Trust in supply side
- Communication
- Benefits

The complete list of categories and subcategories of demand-side drivers is represented schematically in Figure 1.

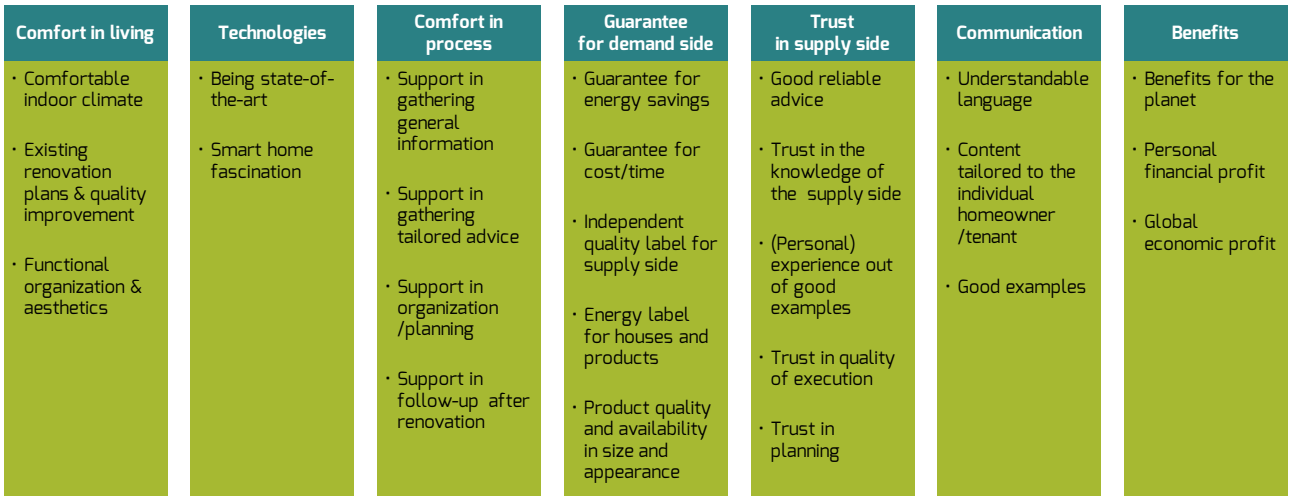

Figure 1: demand drivers according to supply

In a final document for each country the list of drivers mentioned were arranged according to the established general categories.

In report D2.1 of WP2 ("demand side mapping") of the REFURB project, a segmentation of the demand side was established. A segment is a group in the market with similar characteristics. The segmentation is relevant for NZEB-renovation and demand aggregation schemes. These segments are linked with drivers and barriers homeowners face when deciding on NZEB-renovation. Based on this segmentation, drivers and barriers (financial, social, psychological…) are linked with different segments in report D2.2. When comparing the demand-side drivers according to report D2.2 with the demand-side drivers according to the supply side, mentioned in this report, some trends can be distinguished.

The main observation is the **good match** between both perspectives. There is a large overlap between the identified barriers from the demand side and the supply side. This indicates that overall the supply side has a pretty good insight in the motives why homeowners renovate or don't, and how they can be stimulated to renovate, based on the information available.

However, the **mismatches** are also significant. The mismatches appear in 3 dimensions: different clustering, different drivers and barriers, different estimation of the importance of drivers and barriers.

Different drivers will be more or less important for different target groups or segments.

Communication of the supply side is either targeted towards a broad audience, or focused on a specific (market) segment. Further research in the REFURB project has to reveal whether this focus on specific

target groups could be part of a more effective future solution to encourage people to renovate to NZEB. The segmentation established in report D2.1 can be used to define those focus groups and connect the most important drivers with these groups. These will be important to develop the 'most compelling offer' in WP4.

The supply sides' perception of the drivers of the demand side is thus very approximate to the real drivers of the demand side. Only the accents are different. The demand-side drivers and barriers missing in the perception of the supply side, could be seen as ways to organise the demand side or solutions for the supply side that are covered in the following tasks of WP2 (demand side) and WP3 (supply side).

As the problem of mutual understanding between demand side and supply side does not seem a huge problem, it is probably rather the way the supply side appeals on these drivers that needs some adjustment. The REFURB project supposes there are still lots of improvements possible in the organisation, training and communication of the supply side to better target the demand side. This will be investigated in the next reports for WP3.

However, this report is the result of a small research in the EU countries concerned. This study does not take into account all players in the market. It is a possible approach, but some more and deeper studies are necessary to take really grounded overall conclusions.

This report has several links with other REFURB deliverables, as input or output (Figure 2).

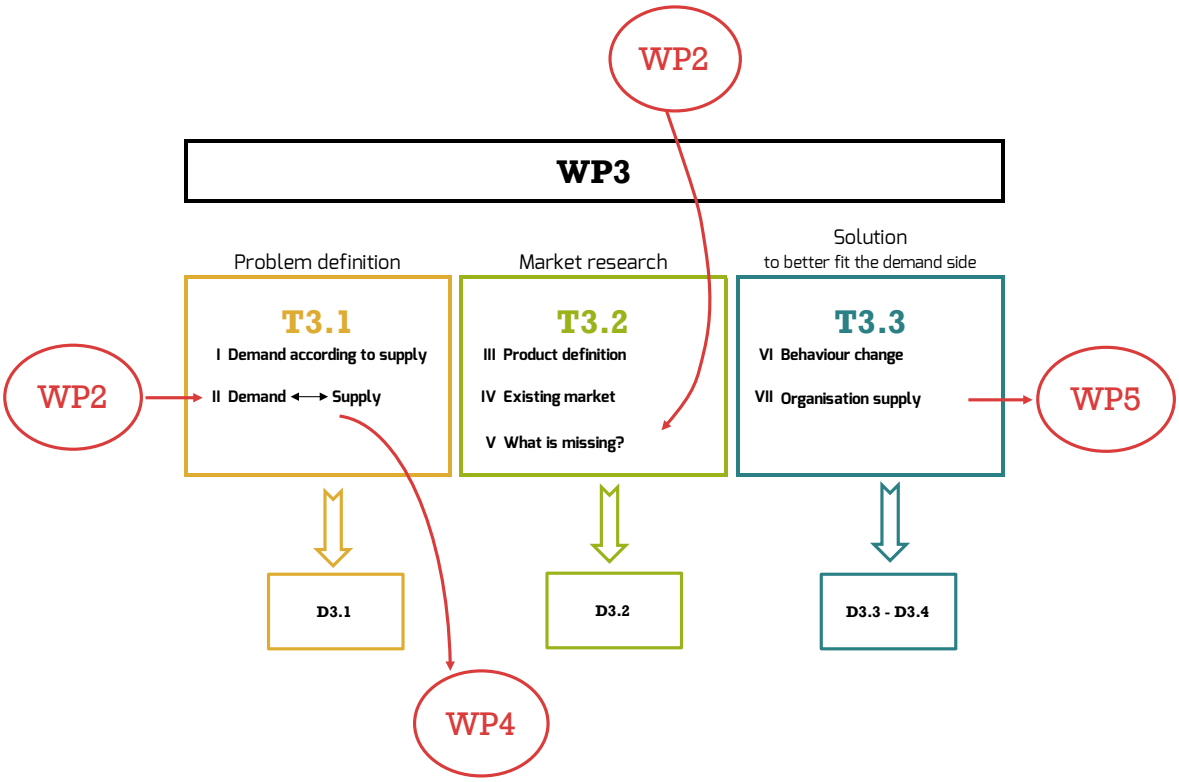

Figure 2: WP3: link with other WP's

This report delivers direct input to task 3.2 and 3.3, to task 4.1 and to task 5.1.

In report 3.2 insight will be gained into existing renovation solutions that are already on the market or very close to market introduction. Finally, in report 3.3 an approach to increase the involvement and organization of the supply side will be developed. In WP4 the most compelling offer to be offered by the supply side to the demand side is developed, starting from the results of earlier work packages. Task 4.1 ('Converting technologies') will cross-link the demand-side drivers (determined in WP 2) with the technical or organizational solutions developed in WP3. WP5 will identify how to ensure high quality and delivery standards. First, in task 5.1 an approach for quality and performance assurance in defined. Second, task 5.2 creates a blue print for an independent organisation that monitors and checks the achieved energy efficiency.

1 Introduction

1.1 OBJECTIVES AND SCOPE

Work package 3 for REFURB focuses on the supply side of the renovation market. The view of the supply side on the demand side and the already known solutions are mapped. Task 3.1 starts with the problem definition of WP3.

The objectives of this first report D3.1 are the following:

- To understand how the supply side perceives the demand drivers;
- To define the problem of mutual understanding.

This task first determines how the supply side perceives the drivers of the demand side: When is an offer compelling to the demand side according to the supply side? This research results in a list of categories of demand-side drivers according to the supply side. Second, with the input from task 2.2, the supply side is confronted with the demand side: 'How does the supply side see the demand side?' Versus 'What is the demand?'. The differences in viewpoint will be made clear. Consequently, it will be possible to determine why there is a problem of mutual understanding between the demand and supply side.

Currently, the supply side is for example often promoting the technological aspects of the solution. Do they feel this is what the customer wants to hear?

The activities for this task consisted of desk research and made use of questionnaires. Where applicable, existing literature was used as well. The result is a report which explains the problem of mutual understanding between the supply and demand side.

1.2 BACKGROUND

Renovation by the private sector towards increased energy efficiency is seriously lagging behind. As more than sufficient technological solutions are available, focus must be on removing non-technological barriers. The main barriers in the residential sector relate to fragmentation of the renovation offer, resulting in inefficient or only partial solutions. In addition to financial restrictions and unclear benefits, homeowners do not have a structured way to obtain all the necessary information. One way to solve this is the use of a '1-stop-shop concept'. Many have been put in practice. Some were successful, others not. They often lack an understanding of the concerns and demands of homeowners.

The REFURB project focuses on the complex interplay of barriers through coordinated process organization, innovation and optimization. This way the REFURB project will bridge the gap between supply and demand side. Therefore, WP2 and WP3 are dedicated to analyze demand and supply-side drivers (Figure 3).

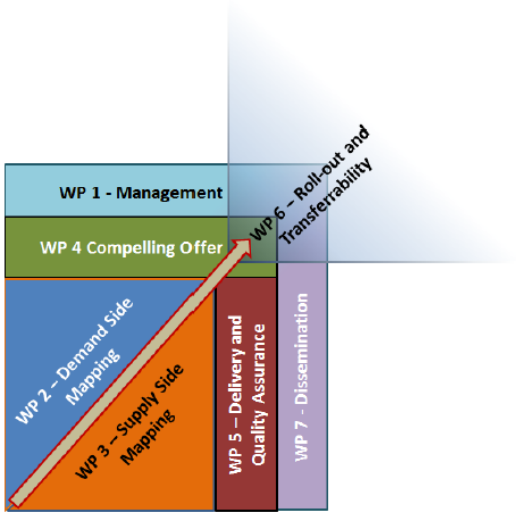

Figure 3: REFURB's work package structure

This report is part of WP3 ('supply side mapping') that focuses on the supply side. This involves suppliers of technologies or technological solutions such as insulation and renewable energy solutions. The objectives of this work package will be realized in three different deliverables (Figure 4). This report D3.1 is about understanding how the supply side perceives the demand drivers and to define the problem of mutual understanding. In report D3.2 more insight will be gained into existing renovation solutions that are already on the market or very close to market introduction. These existing solutions are for standard renovations in line with the regulations, most of them are not developed for NZEB solutions or deep renovations. Finally, in report D3.3 an approach to increase the involvement and organization of the supply side will be developed.

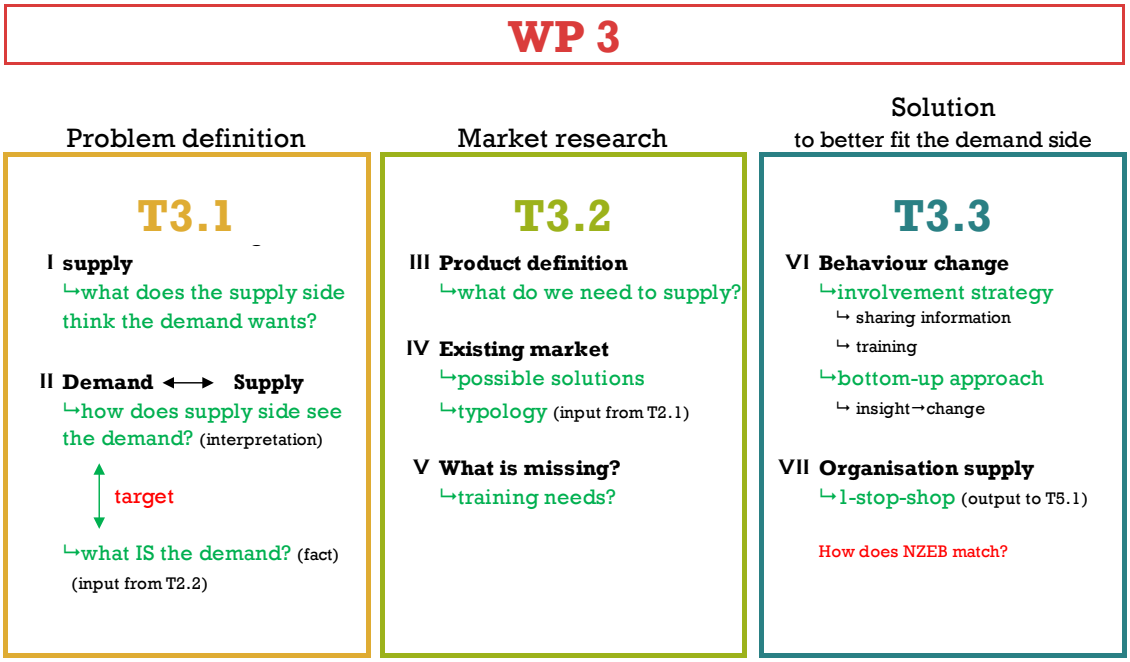

Figure 4: structure WP3

Of course, this reports has several links with other deliverables, as input or output (Figure 5).

This report delivers direct input to task 3.2, task 3.3,task 4.1 and to task 5.1. In WP 4 the most compelling offer to be offered by the supply side to the demand side is developed, starting from the results of earlier work packages. Task 4.1 ('Converting technologies') will cross-link the demand-side drivers (determined in WP 2) with the technical or organisational solutions developed in WP 3. WP 5 will identify how to ensure high quality and delivery standards. First, in task 5.1 an approach for quality and performance assurance in defined. Secondly, task 5.2 creates a blue print for an independent organisation that monitors and checks the achieved energy efficiency.

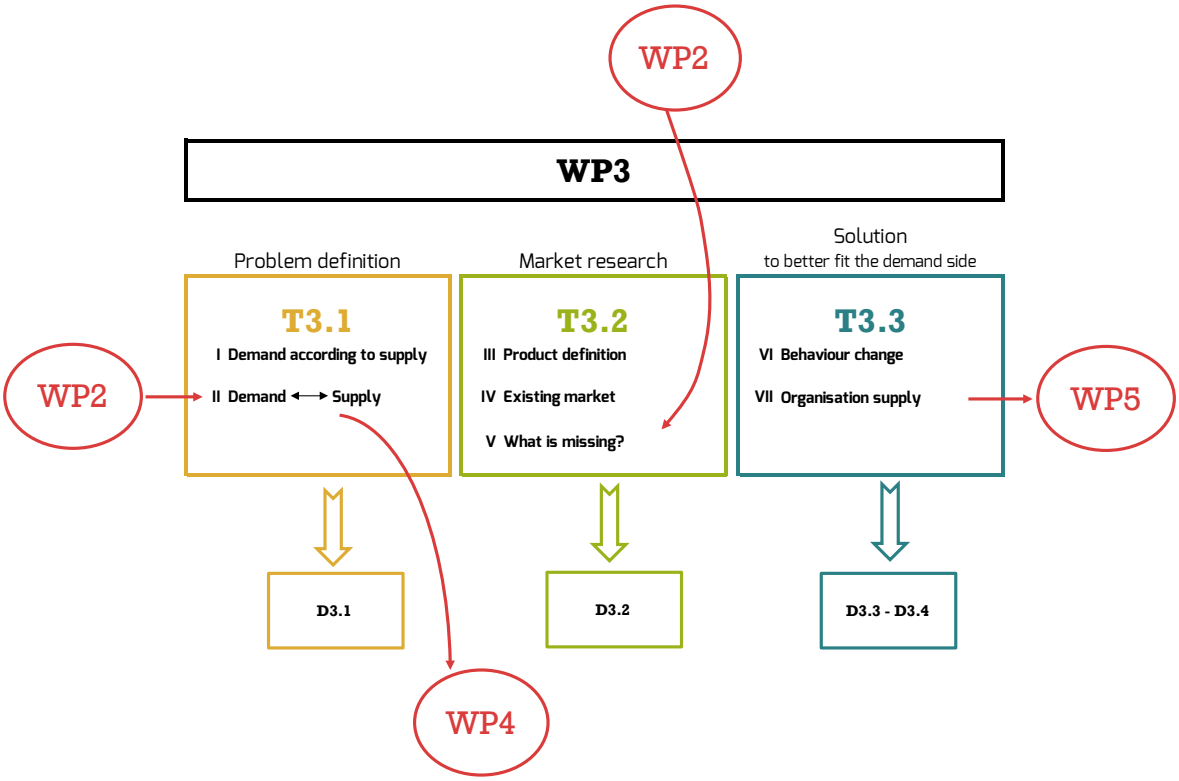

Figure 5: WP3: link with other WP's

1.3 STRUCTURE OF THE REPORT

The structure of this report is conceived as follows.

First the supply side is defined in section 1.4. Chapter 2 deals with the central question on what the supply side thinks the demand side wants. The research question, method and result are explained. The result is a list of categories of demand-side drivers according to the supply side.

By comparing these results to the results of the reports 2.1 and 2.2 (demand side drivers), the problem of mutual understanding between supply and demand side is stated in chapter 3: matches and mismatches are defined. Chapter 4 entails the final conclusion and the link with the next tasks and other workpackages.

1.4 SUPPLY SIDE

WP3 focuses on the supply side[1]. Typically, the supply side for home renovations is supposed to consist of architects and contractors. For the REFURB project, this scope is broadened as suppliers of technologies or technological solutions (for instance insulation products and renewable energy solutions such as photovoltaic (PV) panels) are also considered.

Renovation projects will rarely involve only one actor from the supply side. Sometimes collaboration structures will be formed. The homeowner can take initiative in these collaborations, for instance, in the situation where the homeowner wants to execute part of the construction works him- or herself. The homeowner then coordinates the building professionals he or she appointed (architect, engineering consultants, contractors).

However, not all homeowners are willing or capable of taking up this task. This is especially the case for more complex renovations, such as deep renovations towards NZEB (Mlecnik et al., 2014). Collaboration structures will be set up. They are typically composed of general contractors, specialized contractors (for instance contractors for technical installations, window replacements, wall and floor construction), architects, energy advisors, engineers or others.

Actors participating in these collaborations will have different roles: partners that take the lead in the organization of NZEB renovations and partners that support the lead actor and play a specific role in the collaboration, for instance non-profit organizations who provide information, consultants such as energy experts but also financial instances, parties who are responsible for quality assurance etc.

This diversity of profiles has been taken into account when mapping the demand-side drivers according to the supply side. For instance, contractors are likely to put another emphasis in their communication than consulting actors such as energy experts. Both individual supply-side actors as well as collaboration teams are evaluated.

Finally, while this report will not tackle the subject of how to optimize collaboration structures for NZEB renovations as this is beyond the scope of this task, Task 3.3 of WP3 will further investigate this topic and will build on existing relevant studies such as reports from the projects COHERENO[2] and One Stop Shop[3].

[1] The demand side of the REFURB project refers to homeowners. This topic is covered in REFURB's Work Package 2.
[2] http://www.cohereno.eu/, see references
[3] http://www.one-stop-shop.org/

2 Demand side according to supply side

2.1 RESEARCH QUESTION

The REFURB project focuses on deep renovation of dwellings to NZEB. This project includes all kinds of homeowners of dwellings. These homeowners could either live in their own dwelling (owner-occupant) or rent their dwelling to a tenant.

The final research question of the REFURB project is: How to stimulate private homeowners to renovate their house to NZEB?

To resolve this question, this report looks into **what is driving the homeowners to renovate their home to NZEB according to the supply side?**

Both **drivers** and **barriers** have to be researched. As drivers are positive arguments for homeowners to renovate to NZEB (homeowners are for example more motivated to renovate their house if they feel well-supported in the process of renovation), barriers are negative arguments for homeowners not to renovate to NZEB (a lack of financial possibilities will for example withhold homeowners to renovate their house). These barriers can be important obstacles to overcome before one can start using drivers to stimulate homeowners to renovate to NZEB. Nevertheless, a driver can become a barrier as well as a barrier can become a driver in certain circumstances. The financial cost of the renovation for example can be a barrier, but if the renovation results in energy savings, the financial incentive can become a driver.

2.2 METHOD

First all partners collected existing information concerning the drivers of the demand side according to the supply side like surveys (questions, copy of the original survey) and their results (e.g. graphs, turntables, summary per question) they had access to. A list of literature used is available in Annex 1.

Out of this **research of existing literature** resulted a list of demand-side drivers according to the supply side for each country. The lists of the demand-side drivers mentioned were collected and out of this list resulted a first list of demand-side drivers according to the supply side for all countries.

In most of the countries a lack of studies on this subject was identified: the resulting lists of demand-side drivers according to the supply side were not complete and sometimes very short. Moreover some drivers were not mentioned in some countries although they could be interesting for them too.

Partners collected **advertisements** for energy-efficient and sustainable renovations in their country and determined the drivers of the demand side the supply side appeals to. Although these advertisements were not always for renovations to NZEB, the drivers identified are relevant for renovation to NZEB. A list of consulted material is available in Annex 2. This research resulted in additional demand-side drivers according to the supply side.

Optionally, some partners send out a **new survey** to their network in the supply side to identify other demand-side drivers which were also important according to the supply side. See annex 3 for an example of such a survey.

Summarized, four questions were asked to the partners involved in the REFURB project:

1. What does the supply side think the demand side wants? Listing of the demand-side drivers according to the supply side from the reports/studies/advertisements you have access to (summarised)?
2. Can you collect surveys (questions, copy of the original survey) and their results (e.g. graphs, turntables, summary per question) you have access to concerning the drivers of the demand side according to the supply side?
3. Can you collect advertisements for energy-efficient and sustainable renovations in your country and determine the drivers of the demand side according to the supply side they appeal to?
4. Can you collect the results from new surveys in your network to determine the drivers of the demand side according to the supply side?

Out of these results the **general categories** for the demand-side drivers according to the supply side were determined. Afterwards, the demand-side drivers according to the supply side mentioned in studies, advertisements and surveys, were sorted out according to the determined categories. This enabled drawing general conclusions for each country.

2.3 RESULT

The general categories for the demand-side drivers according to the supply side are determined through research in all countries involved. A list of drivers mentioned in the sources used is available in Annex 4 per country.

This results in an overall list of categories of demand-side drivers (and barriers) according to the supply side, deduced from country inputs.

The main categories of demand-side drivers are: comfort in living, technologies, comfort in process, guarantee for demand side, trust in supply side, communication and benefits, which are described further in the following sections (Figure 6).

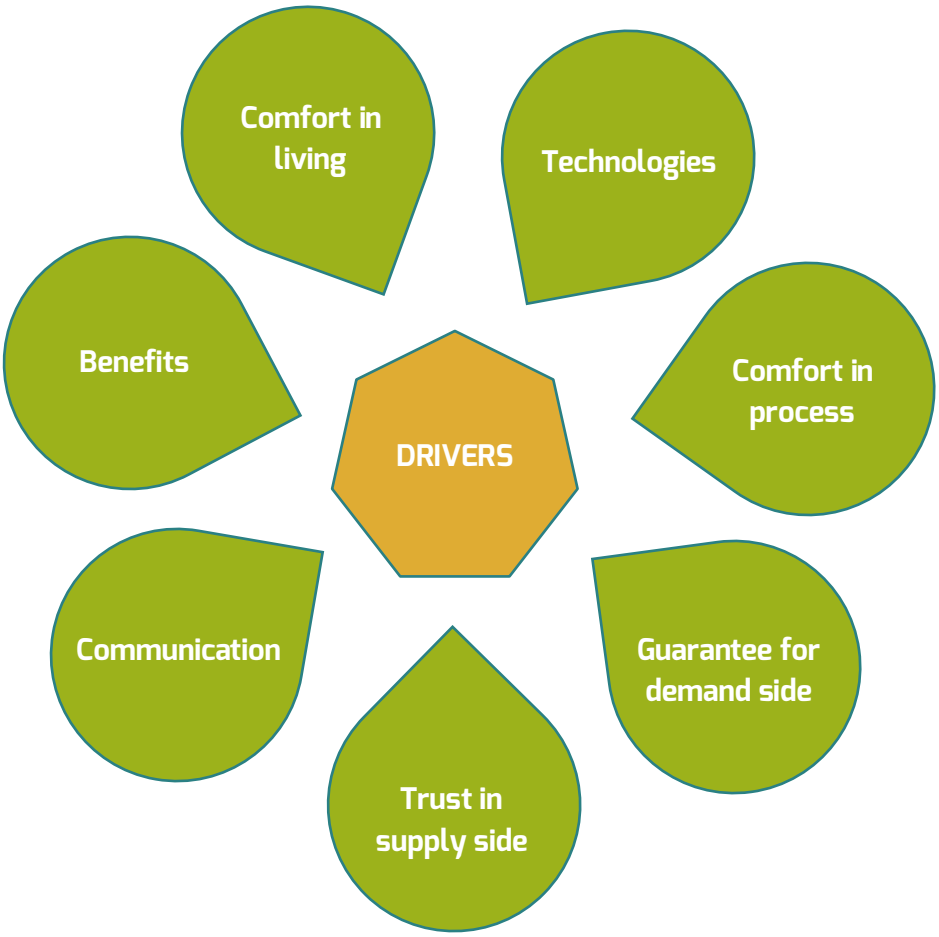

Figure 6: demand drivers according to supply: main categories

In the following it is important to notice that the information gathered is a composition of both direct marketing material and secondary marketing material. In general the secondary material like studies are composed of material that has already been assembled and assessed and in some way confronted with reality. The primary material are usually the result of private initiatives towards the demand side either with or without the integration of lessons learned at the secondary level. Therefore some of the identified drivers are not known to part of the supply-side actors and others are.

The 7 identified categories are described below. They should be read for now as perceptions of the supply side about the demand side.

2.3.1 Comfort in living

2.3.1.1 Comfortable indoor climate

Homeowners renovating to NZEB create a better home with a comfortable indoor climate (general comfortable feeling, thermal comfort, air quality, daylight, acoustics, draft elimination, no cold surfaces etc.) This increases their living comfort.

2.3.1.2 Existing renovation plans & quality improvement

Homeowners who already have existing renovation plans are more likely to renovate their house to NZEB. The planned renovation can be seen as an opportunity to combine it with an energy renovation.

The same applies to houses in need for quality improvement. This quality improvement is often needed to resolve dangerous situations like potential CO-intoxication or severe moisture problems with mold.

Homeowners with older buildings without insulation or energy-efficient techniques and of poor quality seem to be easier to convince to start a renovation to improve the quality of their house. Older buildings also have a higher potential for energy savings.

2.3.1.3 Functional organization & aesthetics

Homeowners wanting to change the functional organisation of their house or to improve the appearance of their house are more likely to be convinced to integrate insulation or energy-efficient techniques with their functional and/or aesthetical renovation.

2.3.2 Technologies

2.3.2.1 Being state-of the-art

Some homeowners want to be state-of-the-art by installing technologies in their house, like for example photovoltaics, heat pumps and other home automation like smart thermostats. These types of homeowners are mainly gadget freaks who are out for having the newest technologies.

As these technologies are important to reach the NZEB energy-efficiency level, this driver could become very important to motivate people to renovate to NZEB.

2.3.2.2 Smart home fascination

Integrating lots of electric devices in an easy-to-use system seems important for some homeowners. This results in a renovated house with a complex smart home system, integrating state-of-the-art equipment. Heating and cooling systems as well as ventilation systems function as main components of a smart home. Often it includes the option of controlling the entire system by smart phone applications.

2.3.3 Comfort in process

Homeowners want peace of mind. They do not like to have stress because of their renovation. Therefore, they like to be accompanied or supported in the total process of renovation, from gathering information and advice to the follow-up after renovation.

A barrier could be that a lot of homeowners have limited time available to organize their renovation.

Unburdening offers are considered the answer to this ‘driver’ of the demand side. Unburdening is a solution to an identified barrier and could thus be a driver.

2.3.3.1 Support in gathering general information

Homeowners want to be supported in gathering general information about NZEB renovations. They do not see the forest for the trees in all the information about renovations coming at them.

2.3.3.2 Support in gathering tailored advice

Homeowners want to be supported in gathering advice tailored to their individual demands, specific wishes, worries and in the assessment of this advice.

2.3.3.3 Support in making decisions

Homeowners look at all the decisions they have to take during the renovation as a heavy burden on their shoulders. That is why they like to have someone to support them in making decisions.

Despite the support in making decisions the homeowner still has to take the final decision. The psychology of making decisions is important to take into account. Therefore, each homeowner should be supported in line with their profile for taking decisions, for example with a lot of objective information or with emotional arguments.

2.3.3.4 Support in organization/planning

Homeowners do not want the stress of organizing the process of renovating. They want a professional to follow up the planning and organize their renovation. This could be for example a turnkey contractor or an architect.

2.3.3.5 Support in follow-up after renovation

According to this driver homeowners also want to be supported in the use of their systems, in the follow-up of problems after execution and in the maintenance. Examples of this support could be teaching homeowners how to use the appliances in their house, to set up the appliances for a specific home or homeowner or to resolve possible teething problems.

2.3.4 Guarantee for demand side

The potential renovators like to have guarantees. They want to know in advance what they can expect at the end of their renovation to NZEB. They want the supply side to give them proof for their assertions.

2.3.4.1 Guarantee for energy savings

Homeowners want to know the total cost of ownership and knowledge about long term costs and benefits. Therefore, they want a guarantee about their energy savings when living in their NZEB renovated house.

This driver also includes the guarantee for the pay-back time of the energy renovation and the guarantee for the lifespan of the energy renovation.

2.3.4.2 Guarantee for cost/time

Homeowners feel reassured if the calculated total cost and the proposed planning are guaranteed. So, they count on not having unpleasant surprises about the proposed cost and planning.

This driver assumes that homeowners are more likely to renovate to NZEB if they have the guarantee that the cost and planning will not change during the project.

2.3.4.3 Independent quality label for supply side (architects, contractors, manufacturers, …)

Homeowners want to have the certainty that the suppliers (architects, contractors who renovate their house and fabricants who deliver products needed for NZEB-renovations) are consciously working on NZEB-renovations and have high and qualified knowledge about it.

2.3.4.4 Energy label for houses and products

Homeowners want to have the certainty that a certain product can deliver a renovation to NZEB and that their house is NZEB. An independent energy label for houses and products meets this solicitude.

2.3.4.5 Product quality and availability in size and appearance

Homeowners prefer high-quality products for their renovation. The manufacturers are supposed to put all their experience and knowledge into the development of these products in order to create the best quality possible regarding material, design, usability, price, persistence etc. At the same time, they generally offer this well-developed equipment in different performance levels to create an offer for different dwelling sizes, refurbishment stages etc. In addition, homeowners prefer to have a range of different products, so they can choose according to their needs and their taste. This driver assumes that homeowners are more likely to renovate to NZEB if they can trust the quality of the products and find an adjusted equipment for use in their renovation.

2.3.5 Trust in supply side

Homeowners need to trust the supply side to get convinced to let them renovate their home to NZEB. They need a clear mind, a reassurance. So, the reliability of the supply side is an important driver. Moreover, this trust from the demand side is something the supply side has to deserve.

Nevertheless, lack of trust in the building sector as a whole can also be an important barrier.

2.3.5.1 Good reliable advice

If people have the feeling they can rely on the advice they get, they are more likely to renovate to NZEB.

2.3.5.2 Trust in the knowledge of the supply side (architects, contractors, manufacturers, …) about NZEB

Homeowners want to feel confident about the architects, contractors and manufacturers they are working with. They have to trust the knowledge of the supply side to get convinced to let them renovate their house to NZEB.

2.3.5.3 (Personal) experience out of good examples

If people can visit or read about good examples of the supply side, they are more likely to trust them to renovate their house to NZEB. Good (personal) experiences are very important triggers to create trust in the supply side, likewise for NZEB renovations. Word-to-mouth advertising remains an important advertising ‘channel’ in the sector.

2.3.5.4 Trust in quality of execution

Homeowners want to renovate their house to NZEB if they trust the quality of the execution of their architect and contractors, since this gives a good feeling to the homeowners.

2.3.5.5 Trust in planning

A reliable planning is an important driver for homeowners to renovate their house. The renovating homeowners want to have the feeling they can rely on the provided planning.

2.3.6 Communication

How communication takes place determines whether homeowners get convinced to renovate their house to NZEB or not. Homeowners ready to renovate need an explanation in easily understandable language at their level and tailored to their demands.

2.3.6.1 Comprehensible language

Homeowners get convinced to renovate their house to NZEB if communication takes place in an understandable language: easy and adapted to the level of the homeowner (with little or high knowledge).

2.3.6.2 Content tailored to the individual homeowner/tenant

Homeowners are more likely to be convinced to renovate their house to NZEB if the content of the communication about NZEB-renovations is tailored to their individual situation.

2.3.6.3 Good examples

Homeowners are more willing to renovate their home to NZEB if they can visit good examples of NZEB renovations. These example projects are useful to explain and immediately show what NZEB renovation is about.

2.3.7 Benefits

2.3.7.1 Benefits for the planet: Environmental/climate issues

Some homeowners want to make their houses more energy-efficient because they know saving energy is needed for climate change mitigation or for the general environment.

2.3.7.2 Personal financial profit

If they can get a lot of personal profit out of it, homeowners are more likely to renovate their house to NZEB. This personal profit after renovation to NZEB can be energy savings, a higher value of the property, subsidies from the government, green loans etc. These profits can be realized at the short term and long term.

2.3.7.3 Global economic profit

The global economic profit of renovating private houses to NZEB on a large scale is multifaceted:

- the creation of more work and jobs;
- a lower consumption and therefore less infrastructure for distribution of energy is needed;
- being less dependent from the energy selling countries;
- …

This can be a personal driver for committed people, but also a driver of a government to determine legal obligations and subsidies.

Figure 7 below summarizes all categories of demand-side drivers according to the supply side in one scheme.

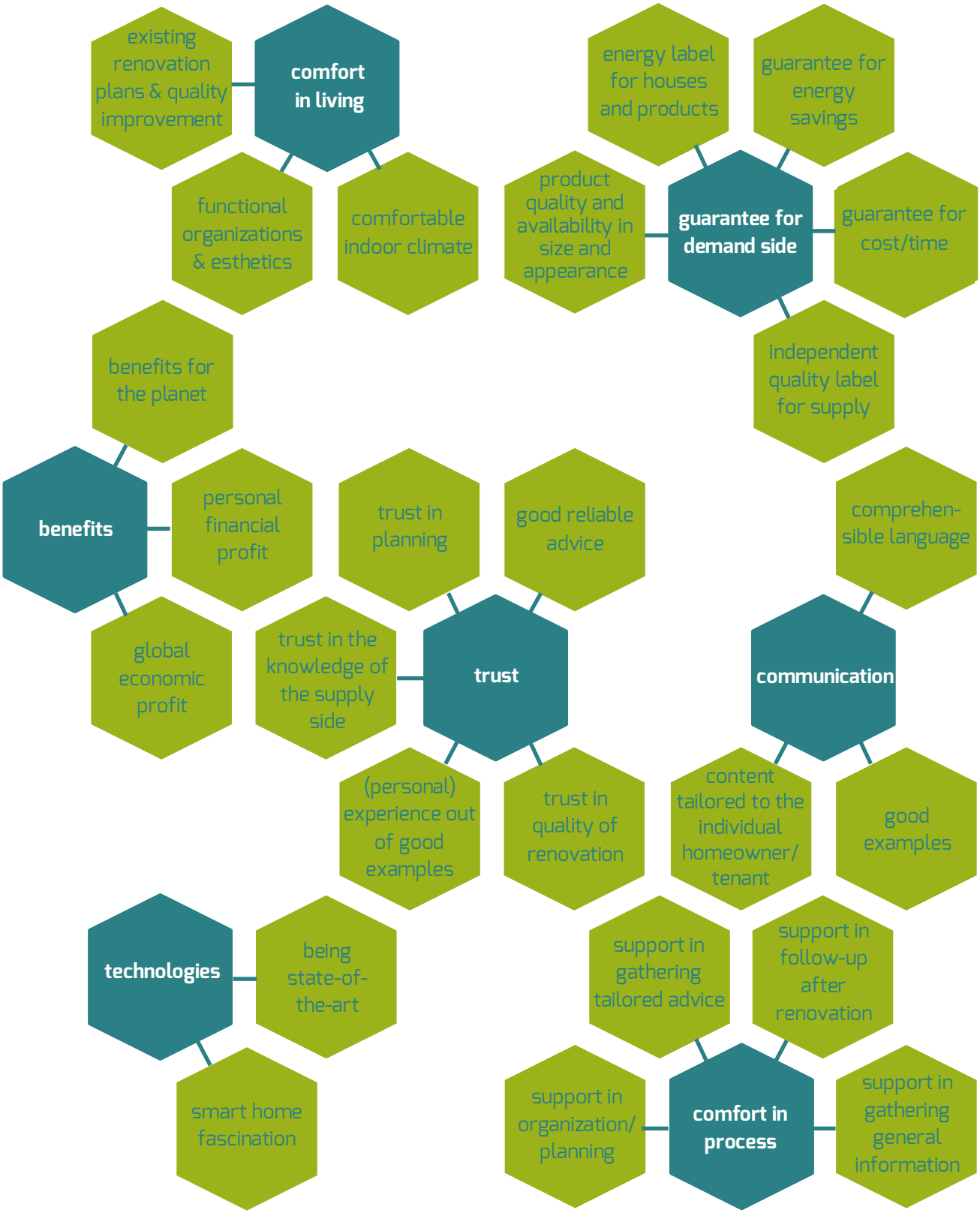

Figure 7: demand drivers according to the supply side

2.4 CONCLUSION

Demand-side drivers according to the supply side were identified through simple research by the partners involved in this project into available material from the supply side. The result is an inventory of the drivers where all driver categories are treated equally. However, certain drivers will be more important according to the supply side than others. The same counts for the demand side when a ranking would be asked for. It is difficult to derive conclusions on this matter, for the reason that the investigated sample is not representative enough. However, intuitively it is clear that the supply side puts an emphasis on comfort and financial benefits.

A difference should be made between the drivers and barriers for a **renovation to NZEB** and those for a **standard renovation**. The drivers and barriers for NZEB renovation are partially similar to the drivers and barriers of the demand-side for standard renovations, but they are not completely the same. As NZEB renovations are generally more expensive and complex it can be expected that some barriers are higher making it more difficult for some drivers to appeal to.

Additionally, most of the supply side offers now only appeal to the drivers for renovation in line with the current regulations, as NZEB is not yet the standard. The advertisements used to derive demand-side drivers according to the supply side rather encourage standard renovations than NZEB renovations.

The standard renovation market today mainly covers other drivers than making a house more energy efficient and sustainable. Homeowners rather renovate to make their house bigger, more functional, more beautiful etc. At this moment there is no general demand for NZEB renovation in Europe, although these NZEB renovations are necessary to reach the long-term EU targets. In addition, there are too little good examples of NZEB renovations in Europe.

Therefore, especially in a first phase, the demand-side drivers linked to standard renovations will have to be used to encourage more deep renovations to NZEB. The supply side should be convinced to offer NZEB renovations while appealing on other demand drivers that directly refer to NZEB renovations. This is why the drivers for standard renovation are also important to mention as drivers for NZEB renovation and will stay important. They will be helpful to create and strengthen a demand for NZEB renovations.

Although the drivers and barriers of the demand side according to the supply are rather similar in all countries involved in the REFURB project, there are some small differences. Some demand-side drivers are country-specific. Below, some tendencies are listed:

- Policies such as those resulting into subsidies vary a lot and therefore can have more impact in some countries than in others. In Estonia for example, subsidies for renovation are rather high. This makes the financial driver important to trigger homeowners to renovate to NZEB.
- As energy costs differ in the different EU countries, the impact of financial benefit from energy savings will also make this driver more or less important.
- In Germany for example, being state-of-the-art and having a smart home seems much more important than in other countries, according to the supply side.

Other demand-side drivers, like for example comfortable indoor air climate and support of the demand side, are the same for all countries involved.

Finally, it is important to mention that these are the results of a rather small study that does not cover all suppliers all over Europe. This must be seen as an interesting starter for further research.

These are the results of a research that started from scratch and avoided to simply copy the demand-side drivers list from report D2.2 and to complete this list. This method makes is easier to find the mismatch in the perception of the supply side, described in the next chapter of this report.

3 Mutual understanding between supply and demand side

3.1 DEMAND-SIDE DRIVERS AND BARRIERS

In report D2.1 of WP2 ("demand side mapping") of the REFURB project, a segmentation of the demand side is established. A segment is a group in the market with similar characteristics. The segmentation is relevant for NZEB-renovation and demand aggregation schemes.

The demand-side segmentation in the REFURB project allows to aggregate the set of most relevant categories of characteristics for segmenting into six clusters:

I. Three clusters of dwelling characteristics, which are important to design consistent NZEB-renovation packages:
   - Cluster 1: similar dwellings (e.g. age, neighbourhood, typology etc.),
   - Cluster 2: state of the dwelling (e.g. need for renovation),
   - Cluster 3: energy saving potential (e.g. energy performance),

II. Three clusters of dweller characteristics, which are important to design consistent demand aggregation schemes:
   - Cluster 1: the right moment for NZEB-renovation for the dweller (e.g. stage of life)
   - Cluster 2: possibilities and intentions of the dweller (e.g. financial possibilities)
   - Cluster 3: the different personalities of the dweller (e.g. behaviour and attitude towards environmental issues)

These segments are linked with drivers and barriers homeowners face when deciding on NZEB-renovation.

Based on this segmentation, drivers and barriers (financial, social, psychological…) are linked with different segments in report D2.2. A thematic clustering of drivers and barriers according to the demand side itself is developed (Figure 8):

- Technical drivers and barriers, linked with the dwelling characteristics and the challenge to renovate to NZEB.
- Financial drivers and barriers, linked with the financial possibilities of the dweller and the cost of the NZEB-renovation.
- Social and behavioural drivers and barriers, linked with the decision-making process of the dweller, so including the behaviour, attitude of the dweller, as well as the (social) conditions to take a decision.
- Context drivers and barriers. These are rather external factors, not directly linked to the dweller or dwelling characteristics, but they deal with the particular situation or context the homeowner has to deal with. E.g. legal and administrative issues, tenant-landlord issues, organisation of the building sector etc.

Using these clusters of drivers and barriers and applying them to the identified segments in report D2.1 gives a better insight into focus areas for removing barriers and using drivers of the identified segments.

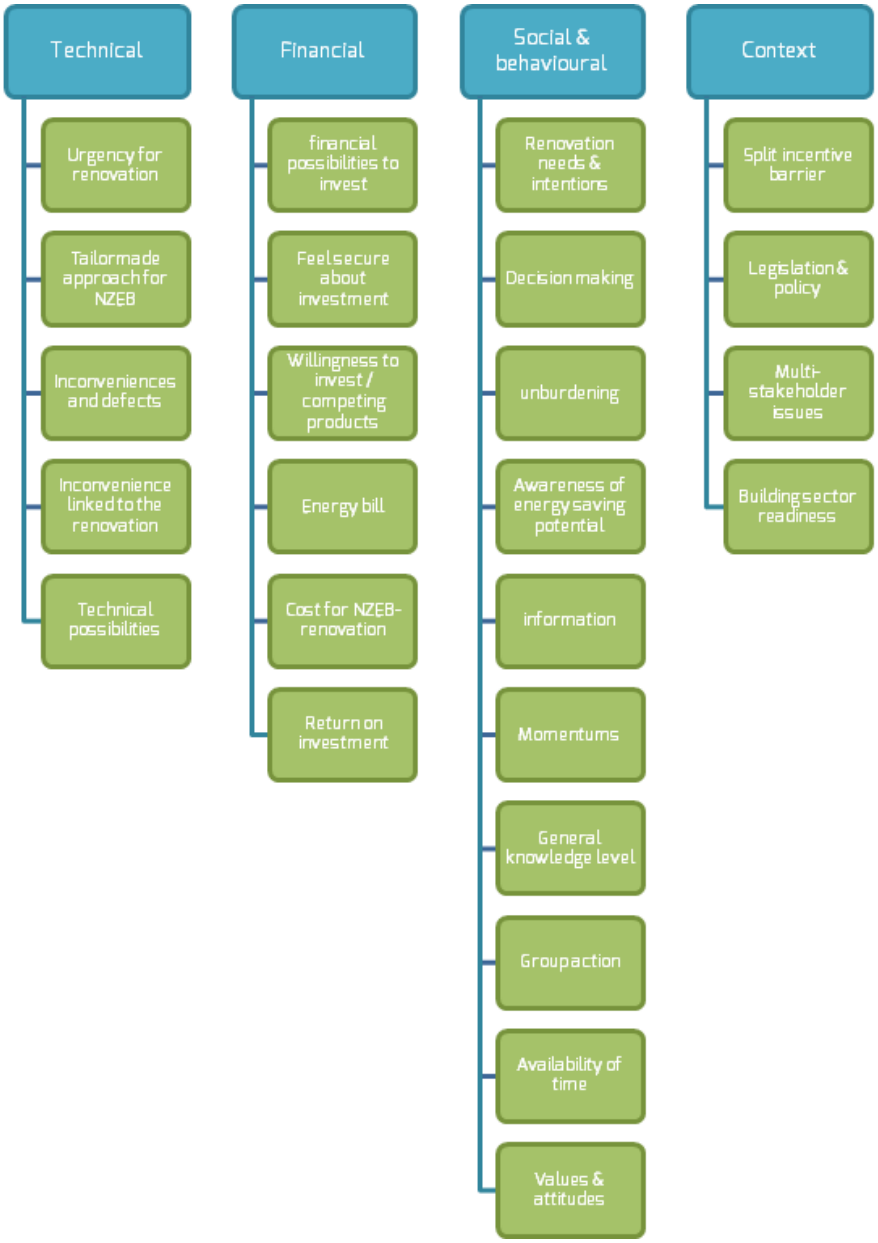

Figure 8: demand drivers and barriers according to WP2

3.2 MATCH AND MISMATCH

When comparing the demand-side drivers and barriers according to the demand side (report D2.2) with the demand-side drivers according to the supply side (chapter 2 of this report), some trends in the match and mismatch between the view of the demand and supply side on the drivers and barriers can be identified.

3.2.1 Match

The main observation is the good match between both perspectives. There is a large overlap between the identified barriers from the demand side and the supply side. This indicates that overall the supply side has a pretty good insight in the motives why homeowners renovate or don't, and how they can be stimulated to renovate.

According to both demand and supply side, these drivers seam important to convince homeowners for energy renovation:

- **Comfort in living**. NZEB-renovation improves the overall quality of the house. This argument dominates all other drivers.
- **Comfort in process**. The renovation process is complex and intensive. Solving this barrier by supporting the demand side creates the main driver to start an NZEB renovation.
- **Communication**. To convince homeowners, comprehensible and tailored communication is a condition.
- **Benefits**. Homeowners renovate to NZEB because it is good for the planet and the global economy, but also for personal financial profit.

3.2.2 Mismatch

However, the mismatches are also significant. The mismatches appear in 3 dimensions:

1. Different clustering
2. Different drivers & barriers
3. Different estimation of the importance of drivers & barriers

3.2.2.1 Different clustering

The clustering of demand drivers differs. This makes a 1-to-1 comparison not obvious. The thematic clustering of drivers and barriers according to the demand side as mentioned in report D2.2 (Figure 8), can also be applied to the list of demand-side drivers according to the supply side (Figure 7), although a category can be attributed to different clusters of WP2. For example, the category 'comfort in living' in this report can be attributed to both the technical and the social clustering of report D2.2.

3.2.2.2 Different drivers and barriers

The supply side identifies a number of drivers and barriers that were not identified as drivers for the demand side from the demand side point of view in report D2.2. Technologies are identified as a driver, such as 'smart home fascination'. The categories 'guarantee' and 'technologies' are not mentioned in report D2.2. This could lead to concluding that these categories are wrong perceptions from the supply side. Nevertheless it is considered that those could still be or become drivers of the demand side. It is possible that currently the demand side simply is not aware because there are not enough possibilities and low availability on the market. This could both apply to special technologies needed for NZEB houses as to reliable and clear energy labelling systems or certifications. So, these missing categories still can be part of the compelling offer developed in WP4. For example, prices can depend on delivered energy savings.

Report D2.2 identifies a number of drivers and barriers that were not identified by the supply side. The demand-side drivers relating to the organization of the community (like neighborhood action, group action and multi-stakeholders issues) seem to be missing in the perception of the supply side. However, these missing demand-side drivers could be seen as ways to organise the demand side, rather than as the drivers behind those solutions. Those solutions are covered in the reports D2.3, D2.5, D3.2 and D3.3.

From the demand side, a number of 'context barriers' were identified, e.g. the split-incentive barrier that is not identified by the supply side. The split incentive barrier relates to the tenant-landlord issue, where the owner (decision maker) can only benefit partially from the advantages of an NZEB-renovated dwelling. As this is a barrier, and has no 'driver-dimension', it was not identified in chapter 3.

3.2.2.3 Different importance of drivers and barriers

Although the same drivers and barriers might be identified, their given weight can differ. Some drivers are elaborated in more detail from the demand side or supply side, with several sub-drivers. For example from the supply side, a greater stress is put on trust in the supply-side guarantee for the demand side (for example labeling). From the demand side, this is not seen as a specific driver to start NZEB-renovation. From the demand side, the financial element seems to be considered to be more important. E.g. a high energy bill and a short-term gain by reducing the monthly bill; or the willingness to invest (related with attitude and behaviour).

However, as this report is the result of a small research in the EU countries concerned, it is not possible to make overall conclusions, let alone to make rankings of these drivers. This could be further researched in deeper studies.

3.2.3 Consequences of mismatch

These differences are important to communicate to the supply side as this means that the supply side does not always appeal to the right drivers. Further research on this mismatch in the perception of the supply side will be conducted in report D3.2 and D3.3.

Different drivers will be more or less important for different target groups.

Communication of the supply side is either targeted towards a broad audience, or focused towards a specific (market) segment. Further research in the REFURB project has to reveal whether this focus on specific target groups could be part of a more effective future solution (developed in WP4) to encourage people to renovate to NZEB.

The segmentation established in report D2.1 can be used to define those focus groups and connect the most important drivers with these groups. These will be important to develop the 'most compelling offer' in WP4.

4 Conclusion

This report is part of work package 3 ('supply side mapping') which focuses on the supply side. The supply side involves suppliers of technologies or technological solutions such as insulation and renewable energy solutions, contractors, architects and other advisors of the demand side. The objectives of this work package will be realized in three different deliverables. This report D3.1 is about understanding how the supply side perceives the demand-side drivers and to define the problem of mutual understanding.

The REFURB project focuses on deep renovation of dwellings to NZEB. The final research question of the REFURB project is: How to stimulate private homeowners to renovate their house to NZEB?

To resolve this question, this report identifies **what is driving homeowners to renovate their home to NZEB, in the eyes of the supply side?**

Both **drivers** and **barriers** were researched. As drivers are positive arguments for homeowners to renovate to NZEB, barriers are negative arguments for home homeowners to renovate to NZEB. These barriers can be important obstacles to overcome before one can start using drivers to stimulate homeowners to renovate to NZEB. Nevertheless, a driver can also become a barrier in certain circumstances.

This results in a list of categories of demand-side drivers (and barriers) according to the supply side, deduced from the input from all partners in the REFURB project. Seven **general categories** could be derived:

- Comfort in living
- Comfort in process
- Technologies
- Guarantee for supply side
- Trust in supply side
- Communication
- Benefits

The complete list of categories and subcategories of demand-side drivers is summarized in Figure 9.

The supply sides' perception of the drivers of the demand side is very approximate to the real drivers of the demand side. Only the accents are different. The differences between the real demand-side drivers and what the supply side thinks about the demand-side drivers does not really seem a big problem anymore, probably because the supply side is already looking for ways to encourage homeowners to use their products and services. The supply side seems to appeal more and more to the comfort and trust of homeowners, rather than to the technical side of their offer.

The demand-side drivers and barriers missing in the perception of the supply side, could be seen as ways to organise the demand side or solutions for the supply side that are covered in the following tasks of WP2 (demand side) and WP3 (supply side).

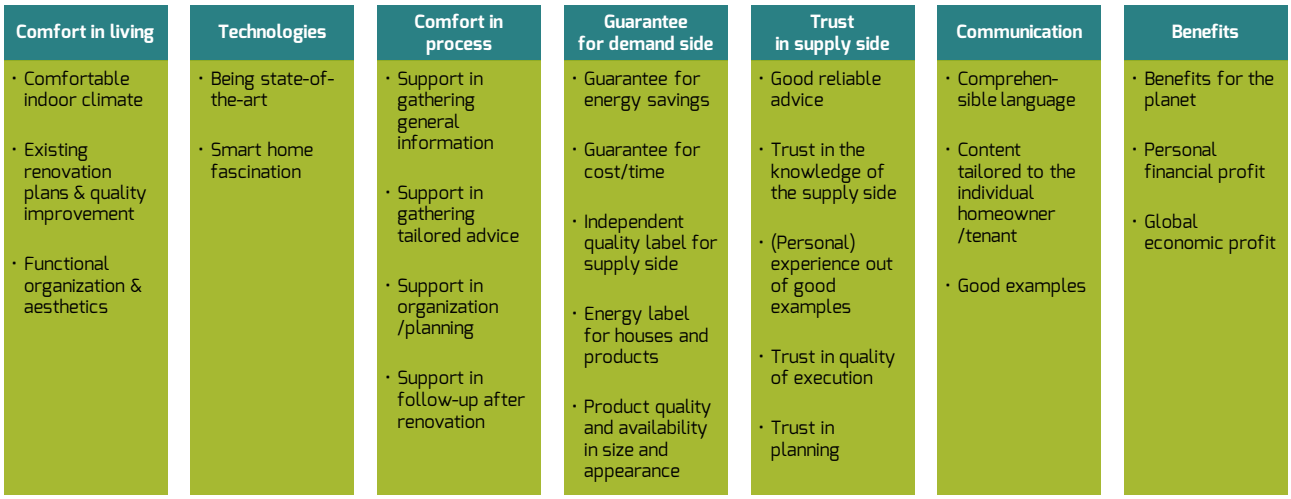

Figure 9: demand drivers according to the supply side

It is probably the way the supply side appeals to these drivers that needs some adjustment. The REFURB project supposes there is still lots of improvement possible in the organisation, training and communication of the supply side to better fit the demand side's needs and triggers. This will be investigated in the next reports for work package 3. In report D3.2 insight will be gained into existing renovation solutions that are already on the market or very close to market introduction. Finally, in report D3.3 an approach to increase the involvement and organization of the supply side will be developed.

However, this report is the result of a small research in the EU countries concerned. This study does not take into account all players in the market. It is a possible approach, but more and deeper studies are necessary to take really grounded overall conclusions.

This reports has several links with other deliverables, as input or output (Figure 5). This report delivers direct input to task 3.2, task 3.3, task 4.1 and task 5.1. In report D3.2 insight will be gained into existing renovation solutions that are already on the market or very close to market introduction. Finally, in report D3.3 an approach to increase the involvement and organization of the supply side will be developed. In WP4 the most compelling offer to be offered by the supply side to the demand side is developed, starting from the results of earlier work packages. Task 4.1 will cross-link the demand-side drivers (determined in WP 2) with the technical or organizational solutions developed in WP3. WP5 will identify how to ensure high quality and delivery standards. First, in task 5.1 an approach for quality and performance assurance is defined. Secondly, task 5.2 creates a blue print for an independent organisation that monitors and checks the achieved energy efficiency.

5 References

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Annexes

Annex 1 – List of literature

Annex 2 – List of advertisements

Annex 3 – Danish Survey

Annex 4 – List of demand-side drivers according to the supply side