

Mapping and segmentation of barriers & description of supermarket sector

Report 1



SUPERSMART

Public report

for the project:

SuperSmart - Expertise hub for a market uptake of energy-efficient supermarkets by awareness raising, knowledge transfer and pre-preparation of an EU Ecolabel

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1 INTRODUCTION

Efficient solutions for supermarket heating, cooling and refrigeration - such as integrated systems or the use of natural refrigerant-based equipment - are already available in the market in Europe. However, their use is not yet widespread due to remaining non-technological barriers, including lack of knowledge and awareness, social, organizational and political barriers.

The European project SuperSmart aims at removing these barriers and additionally supports the introduction of the EU Ecolabel for food retail stores. The EU Ecolabel can encourage supermarket stakeholders to implement environmentally friendly and energy efficient technologies and thus reduce the environmental impact of food retail stores.

Within the project, a preliminary investigation on perceived non-technological barriers amongst supermarket stakeholders has been carried out. The clear identification of barriers and their contextualisation in terms of relevance, geographical distribution, stakeholder relation is necessary to properly address countermeasures and in particular to develop campaigns to raise the general awareness and spread the information about energy efficient and eco-friendly supermarkets and training activities within the following specific topics:

1. Eco-friendly supermarkets - an overview
2. How to build a new eco-friendly supermarket
3. How to refurbish a supermarket
4. Computational tools for supermarket planning
5. Eco friendly operation and maintenance of supermarkets
6. EU Ecolabel for food retail stores

2 NON-TECHNOLOGICAL BARRIERS

Non-technological barriers hinder the diffusion of already existing energy efficient and natural-refrigerant based solutions for food retail stores and slow down their natural evolution and improvement, basically limiting the necessary experience that is to be gained in the field.

Five categories of non-technological barriers are identified and described for the food retail sector.

2.1 Awareness barrier

Although efficient technology in the supermarket sector is available and gaining a higher market share, there are still many people who are not aware of the different possibilities to increase energy efficiency in supermarkets and that there is a real possibility to apply those technologies to the supermarket site they are planning, running or refurbishing.

2.2 Knowledge barrier

Target groups involved in the choice and employment of efficient heating and cooling solutions in supermarkets often lack the necessary knowledge to operate in the best way. As technologies evolve towards more efficient solutions, system complexity increases and interdisciplinary knowledge is required to fully understand the integration of subsystems and implication of specific choices on the final energy bill.

2.3 Social barrier

The social barrier is related to the bias of (some) target groups towards changes under multiple aspects, such as: technology, planning procedures, and collaboration necessary to implement energy efficient solutions. For instance, some planners may have concerns regarding new efficient technology, as they do not want to move from the technology they are very experienced in and which makes them very confident in achieving the final result (realisation of the supermarket site).

2.4 Organisational barrier

The organisational barrier refers to the relation between two or more stakeholders involved in planning or operation of a supermarket, which impede the uptake of more efficient heating and cooling solutions. The organisational barrier is often related to conflicting interests. Each supermarket stakeholder has his/her own interests, which may interfere with the interests of other stakeholders. For instance, the stakeholder who pays for the system is often not the same who pays the energy bill.

2.5 Legislative barrier

Although major parts of supermarket systems and subsystems are actually affected by relevant EU regulations in terms of environmental sustainability, there is a lack of legislation considering the supermarket system as a whole. There is no strong legislative incentive towards energy efficient supermarkets as a whole and neither against inefficient ones, except for some regional/national regulations.

Regulatory standards can be a key driver for sustainability; however cost increase related to standards is to be kept under control in order not to determine a loss of competitiveness. According to [Forum for the Future, 2009], in regions with stronger regulations, consumers feel safer and they are therefore less fierce in scrutinising retailers' credentials.

3 FOOD RETAIL SECTOR STAKEHOLDERS

Stakeholders are identified within target groups directly or indirectly related to planning, designing, installing, operating, maintaining and refurbishing heating, cooling and refrigeration systems for food retail stores. Each group has an active role in promoting or impeding the adoption of efficient solutions and their behaviour is affected by non-technological inputs.

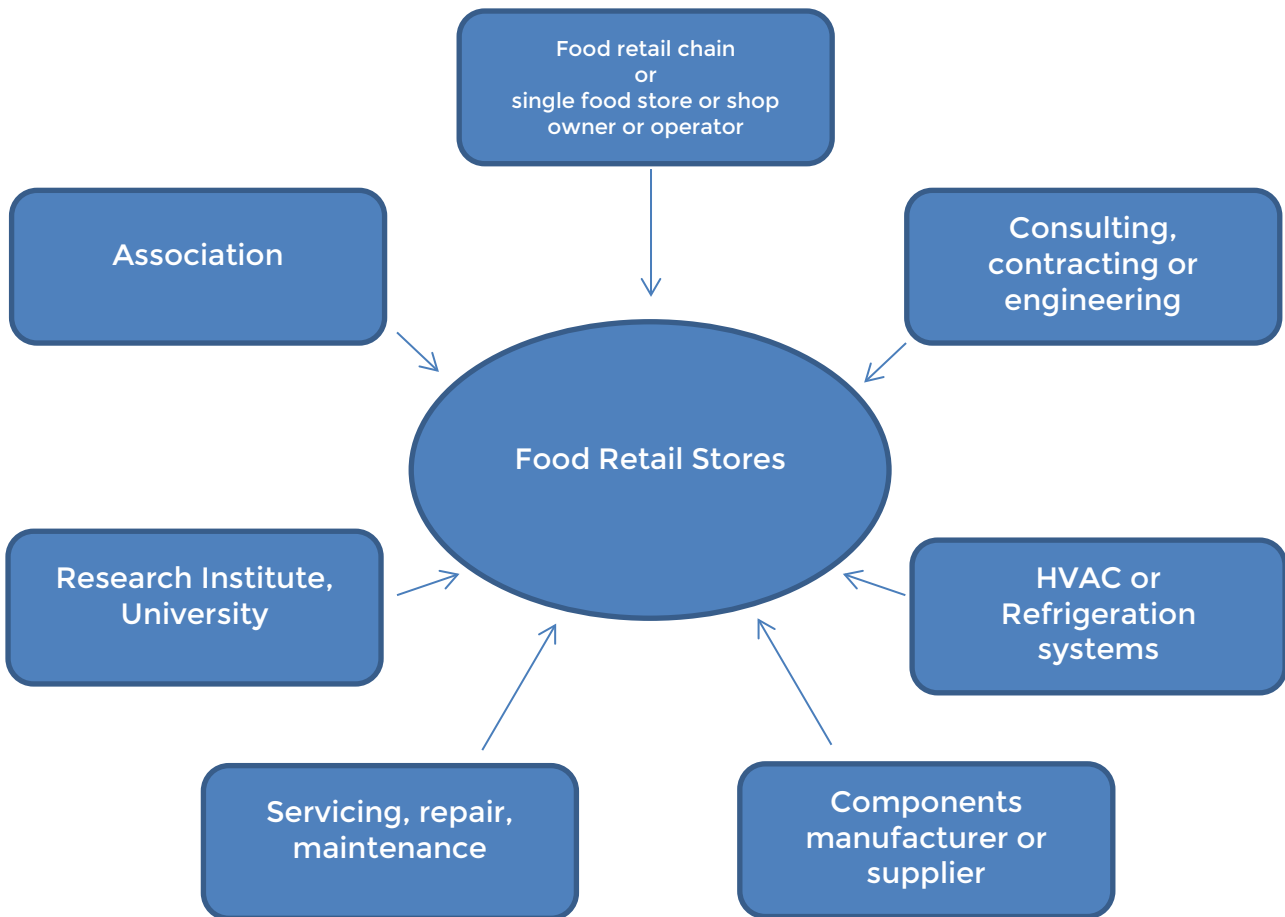


Figure 3-1: Food retail store energy systems stakeholders

4 EUROPEAN REGIONS

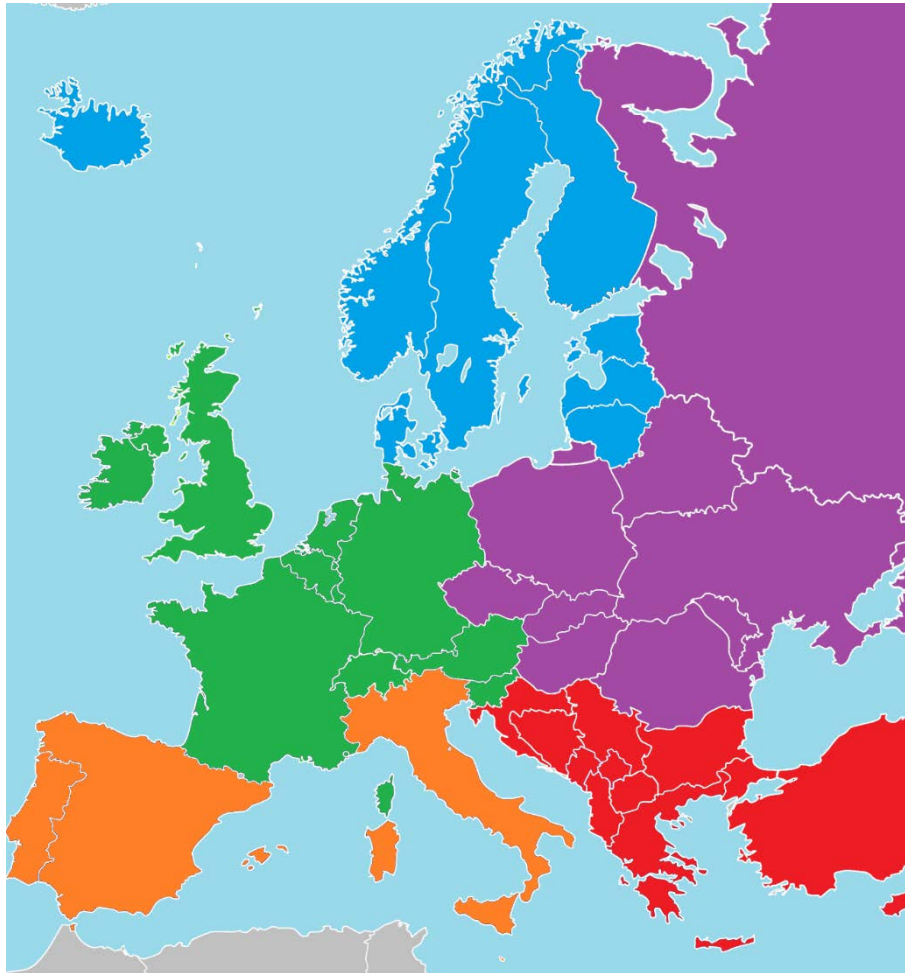


Figure 4-1: European regions

As represented in Figure 4-1, Europe is divided into five regions: North, Centre West, Centre East, South West and South East, including Turkey. This division mainly takes into account the climatic conditions, which are majorly affecting the HVAC&R systems energy consumption and therefore the adopted technology both for HVAC&R systems and building construction. At the same time, geographic division often corresponds to commercial areas for system manufacturers and suppliers.

To some extent, the geographic perspective includes also social and cultural aspects, which are relevant to the topic. As a matter of fact, shopping habits (opening hours, shopping frequency, convenience stores vs hypermarkets or shopping malls, diffusion of online shopping), food traditions (fresh vs frozen), average income, etc. influence the adoption of specific solutions and the resulting energy consumption. However, there might be significant differences within the same geographical region. For instance, while the UK and France do not have any regulations on supermarkets opening hours, there are such limitations in Germany, thus stating a significant difference in shopping habits inside the same geographical region. Many differences can also be found in food traditions in terms of diffusion of “modern retail”, i.e. large and diverse store formats offering a wider assortment of goods, sometimes highly integrated into a sophisticated supply chain, with ownership concentrated in a small number of national or international retail groups, fully defined in [EY Cambridge Econometrics Ltd. Arcadia International, 2014]. For example, in Italy the market share of modern retail is much lower than in Spain and Portugal,



5 SURVEY STRUCTURE

The first section of the survey asks respondents to identify their business sector and role in the organisation, together with the geographic location of their activity. Moreover, respondents are tasked to indicate only those European region(s) they are familiar with.

Specific questions are posed to food retail chains or shop owners, intended to investigate the average size of their shops and their prevalent ownership model.

In the second part of the survey, respondents' attitude towards low carbon solutions is analysed. Gained experience in energy efficiency and low environmental impact systems is investigated.

In the third part of the survey, a general assessment of the importance of the identified non-technological barriers (presented in Section 2) is carried out, by asking about the importance of each of them, the difficulty in removing the respective barrier, and the potential impact deriving from its removal.

Questions on each barrier separately are then presented to understand where the major obstacles lie.

The respondents' general attitude about the EU F-gas Regulation (EU F-Gas) and the Energy Performance of Buildings Directive (EPBD) is also registered.

In a specific section regarding the EU Ecolabel, respondents are asked how they feel an EU Ecolabel might affect their business.

Finally, respondents are encouraged to best practice examples about pilot installations etc., as well as express the willingness to be kept informed about the SuperSmart project or to actively participate.

5.1 Survey language

The Survey was available in six languages: English, French, German, Italian, Serbian, and Spanish.

5.2 Survey availability

The survey was available online from 18.04.2016 to 17.06.2016 on the project website www.supersmart-supermarket.org. Answers were also collected on paper during a dedicated workshop held in Barcelona on 18.04.2016 under the ATMOSphere 2016 Conference.

6 SURVEY OUTCOMES

The total number of respondents was 300; the completion rate was 32 %, i.e. 96 respondents came to the last page of the survey. Amongst the 204 partial ones, 82 respondents provided identification of their business and a significant number of answers, therefore the **total number of valid questionnaires is 178**.

6.1 Business sector, geographic location and role in the organisation

The geographic location of the respondents was identified at first: **79 % of them belong to European organisations** (global headquarters located in Europe), 10 % come from US companies. The largest group of respondents (**52 %**) is **manager**, while **35 % belong to the technical area** (designers, researchers, technicians) (Figure 6-1).

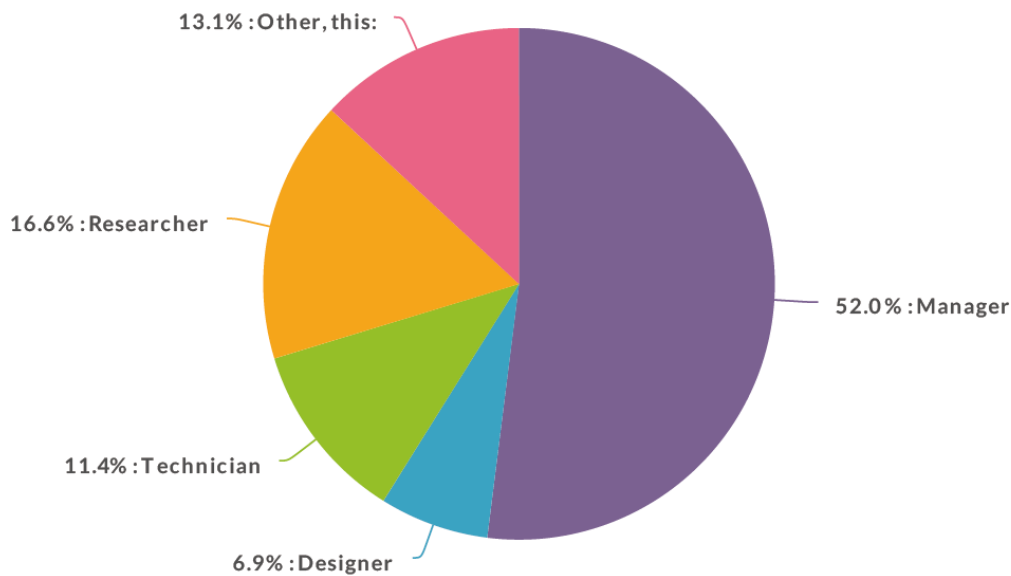


Figure 6-1: Role in the organisation

As far as the European organisation headquarters are concerned, Figure 6-2 details the actual geographical distribution, showing a **significant share of German (19.7%) and Italian (15%) organisations**. In general terms, organisations coming from North, Central and South West Europe are well represented in the survey, while there is no relevant representation of companies based in the Eastern part of Europe.

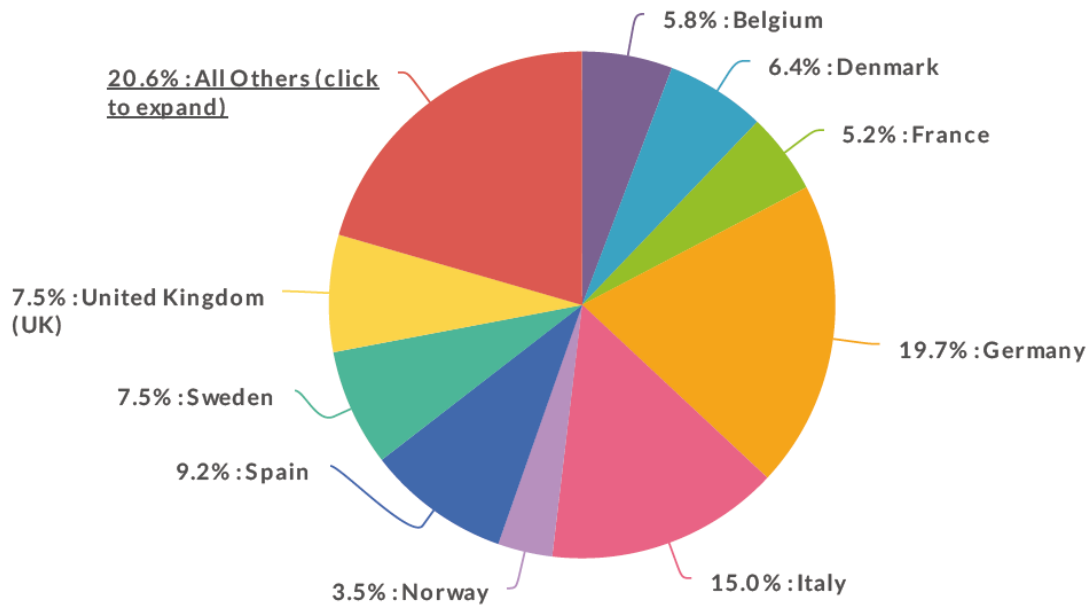


Figure 6-2: The headquarters location for European respondents.

In Table 6-1 the represented business sectors are detailed, showing that **an important role is played by refrigeration and components manufacturers and suppliers**. These companies are often based in Germany and Italy, thus providing explanation for the previously presented geographical distribution of European headquarters location.

Food retail chains are represented by 12 respondents, mainly covering managerial roles. Their EU headquarters are based in Central West and South West Europe, but they declare knowledge of the entire EU market, thus guaranteeing a good coverage for all regions. The represented end users (food retail chains) run 100 % standalone sites (none inside shopping malls) and near 78 % state that the predominant ownership model includes totally owned and operated by the owner stores. Single store owner (1), small chains (9 shops) as well as large ones (1200 shops) are represented. The average size of the stores is almost equally distributed amongst small, medium and large sites, with a negligible predominance of hypermarkets (>4500m2). Therefore, despite the limited number of food retail chains represented in the survey, they provide a good representative sample of the EU market.

Table 6-1: Business sectors represented in the survey

Value	Percent	Count
Food retail chain / Single store owner	6.8 %	12
System manufacturer HVAC	13.1 %	23
System manufacturer Refrigeration	29.0 %	51
Components supplier	31.8 %	56
Consulting, contracting, engineering	19.3 %	34
Servicing, repair, maintenance	11.4 %	20
Association	4.0 %	7
Research institute / University	15.3 %	27
Other	6.8 %	12

Finally, there is a **good coverage of the North, Central West and South West regions** in terms of declared business sector knowledge and experience from all stakeholder categories. 39 respondents claim to have knowledge of all European regions (all regions selected).

Table 6-2: Coverage of the North, Central West and South West in terms of declared business sector knowledge and experience

Value	Percent	Count
North	57.2 %	99
Central West	56.6 %	98
Central East	35.3 %	61
South East	36.4 %	63
South West	50.3 %	87

6.2 Attitude towards low carbon solutions

The importance of energy efficiency for different stakeholders is presented in Table 6-3 where the percentage of respondents attributing the top score (5) is listed, together with the average score (1-5). What is clearly emerging is that the closer the stakeholder is to the final complete installation, the higher is the importance given to energy efficiency: **all food retail chain respondents gave 5 stars (top score) to energy efficiency**, while only 41 % of the components suppliers did this.

Table 6-3: Stakeholders' attitude towards energy efficiency (score 1-5)

	Top Score (%)	Average Score (1-5)
Food retail chain / Single store owner	100 %	5
Consulting, contracting, engineering	50 %	4
Association	50 %	4
Servicing, repair, maintenance	47 %	4
System manufacturer: HVAC	45 %	4
Components supplier	41 %	4
System manufacturer: Refrigeration	36 %	4
Research Institute / University	33 %	4

Near 50 % of respondents from all categories recognised **LED lighting** and **high efficiency motors** as the widespread energy saving solutions; also A class rated HVAC systems have been experienced, directly or indirectly, by near 30 % of those surveyed.

When asked to list which solutions for energy efficiency they practised in a direct or indirect way, 25 % reported **system** monitoring, control and optimisation, and 22 % (from all stakeholders groups) reported closure (**doors and lids**) of **display cabinets**. Over 50 % described **modifications to the refrigeration systems**, under different aspects such as components, refrigerants (natural R290 and R744), or integration with HVAC. Only one respondent focused on the building (insulation of the roof). Considering that the question is related to existing installations, it seems that the refrigeration subsector is the one undergoing the most relevant technical changes, although different in content.

Heat recovery is practiced by over 70 % of the respondents, thus confirming that it is actually becoming a widespread solution.

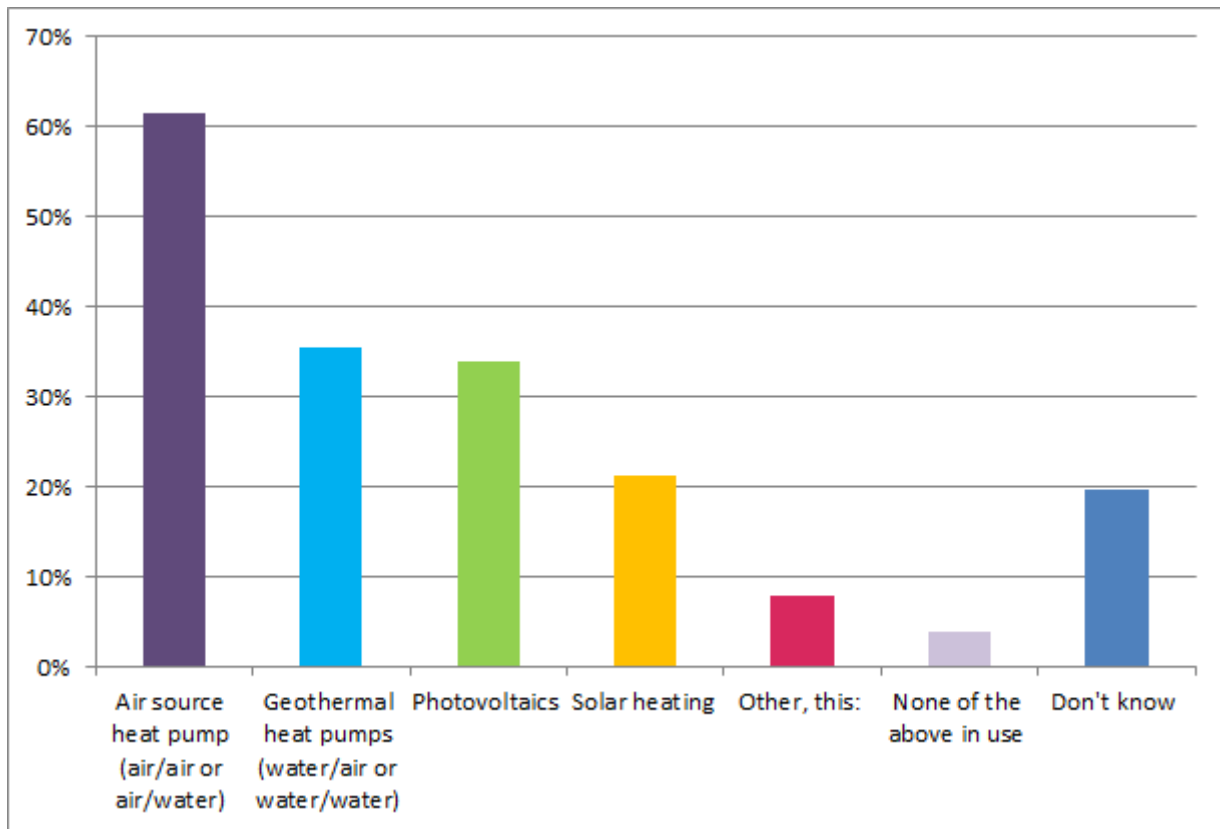


Figure 6-3: Experience with renewable energy sources

Utilization of renewable energy sources is extensively practised; amongst them air source heat pumps are used by over 60 % of the respondents (Figure 6-3: Experience with renewable energy sources).

Carbon dioxide is the most widespread **natural refrigerant** (81%), followed by hydrocarbons (60 %), as detailed in Figure 6-4:

Remote monitoring and control is pursued by 75 % of the respondents; the largest part (40 %) uses advanced monitoring, i.e. innovative data management, fault detection, etc.

Finally, provided that energy efficiency is considered important by almost all interviewed stakeholders, 51 % of them expect the **payback time** for energy efficient solutions to be within 3 years, while 42 % can accept 6 years as a reasonable timeframe.

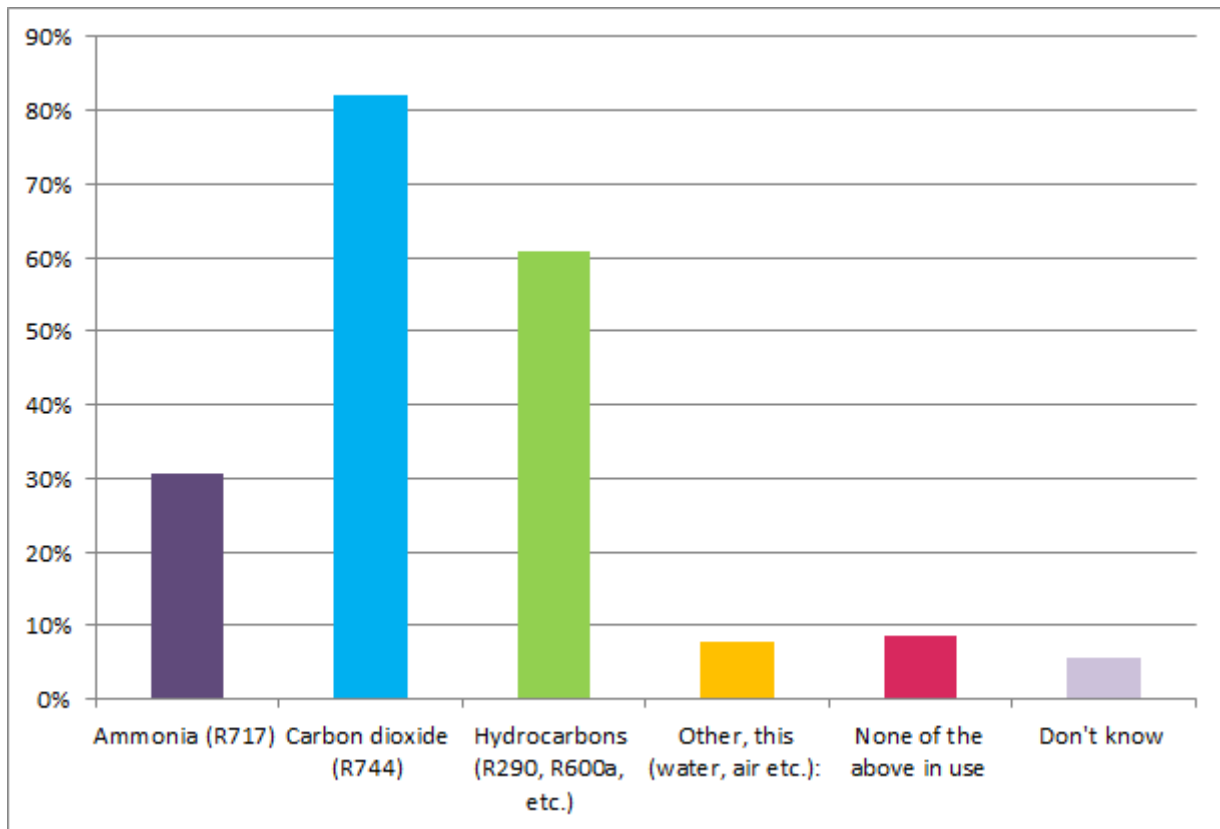


Figure 6-4: Experience with natural refrigerants

6.3 Non technological barriers

Respondents were initially asked to rate the importance of each proposed non-technological barrier (see Section 2) in the EU regions they experience in their business. A 1-5 score system (1: not important, 5 very important) was used.

The **awareness barrier** gets a **uniform score of 3 all over Europe**, except Central East and South East, where it becomes a little bit more important (3.5).

The **knowledge barrier** is considered less important (3) in the North than in the rest of Europe (3.5).

The **social barrier** is not felt as an obstacle in North Europe (2.5), while its relevance increases moving to the Central West region (3) and to the other areas (3.5).

The **organisational barrier** is evaluated in the same way (3.5) all over Europe, except in the North region (3).

Finally, the **legislative barrier** weighs the same (3) all over Europe, although, within a uniform legislative frame (EU F-gas Regulation, EPBD, EU Ecodesign Directive), different local rules are put in place for instance for natural refrigerants, especially in the Nordic Countries.

When asking **how easy it is to remove** each of the identified barriers (1-5 score; 1 = easy to remove, 5 = most difficult to remove), the **worst case was the legislative barrier** (average score 3.6). 43% of respondents gave it the top score (5), equally distributed amongst all stakeholders and EU regions. Worst after legislative barrier were social (3.4) and organisational (3.2) barriers; the best situation was found for awareness (2.3) and knowledge (2.4). When referring to the knowledge barrier, the worst score (4 and 5) was mainly concentrated in the North Region even if the knowledge barrier was considered the least important barrier in the previous question. Food retail chains estimated removing the legislative (4.2) and

organisational barriers (3.7) would be more difficult, while the knowledge and awareness barriers were estimated less problematic than for the rest of stakeholders.

The **social barrier** is considered as the one that, **once removed, could have the highest positive impact** (score 3.6 in a 1-5 range). The second most positive impact could be the one obtained by removing organisational and awareness barriers (3.1). The legislative and knowledge barriers are considered the least important to this extent (2.6 and 2.7). **Financial incentives** were suggested as a possibility to promote energy efficiency in the food retail sector and to reduce the impact of the barrier represented by the initial/investment cost.

6.3.1 Awareness barrier

Table 6-4: Rating of the proposed awareness barriers for energy efficient heating & cooling in the European food retail business, from weak barrier (1) to strong barrier (5).

	Top score (%)	Average score (1-5)				
		North	Central West	Central East	South East	South West
Lack of awareness of available technology at decision making level	2 %	2.2	2.4	2.9	2.9	3.2
Lack of awareness of financial support (by banks, financial bodies or govt funding) or reward schemes for energy efficiency	3 %	2.6	2.8	3.2	3.1	3.2
Lack of awareness of possible financial savings from energy efficient solutions	4 %	2.4	2.8	3.1	2.9	3.2
Lack of awareness of the environmental benefit of energy efficient systems	3 %	1.9	2.4	2.6	2.7	2.9

The rating of the awareness barrier is presented in Table 6-4. The North region does not experience the proposed awareness obstacles as being as important as the South West area, where nearly all the suggested barriers have the same relevance.

Amongst the comments, one respondent belonging to the Consulting, Contracting and Engineering group claims that the lack of awareness on the potential attractiveness of energy efficiency towards customers is a barrier; this obstacle is experienced as very important in South West Europe (5), important in central West (4) and not really important in the North (1).

6.3.2 Knowledge barrier

Table 6-5: Rating of proposed knowledge barriers for energy efficient heating & cooling in the European food retail business, from weak barrier (1) to strong barrier (5)

	Top score (%)	Average score (1-5)				
		North	Central West	Central East	South East	South West
Lack of training programs	3 %	2.8	2.8	3.0	3.5	3.5
Lack of experienced trainers	3 %	3.0	3.2	3.3	3.7	3.7
Lack of free or low-priced educational material, easily available	6 %	2.8	2.8	3.0	3.4	3.2
Lack of education material for different technical knowledge levels	3 %	2.7	2.8	3.1	3.4	3.2

Table 6-5 presents the rating for knowledge barriers according to geographic region. The proposed knowledge barriers are felt much more when moving southward; the lack of experienced trainers is considered the biggest hindrance amongst the proposed barriers.

The lack of training interest is also proposed as a barrier in South West Europe, together with the absence of experienced specialists (5) in Central and South Regions. These hindrances may be considered also as social barriers.

Considering the stakeholders, in the North consultants, contracting and engineering respondents recognise the greatest importance of the knowledge barrier, while in the rest of Europe the top score is provided by refrigeration systems manufacturers and components suppliers. **End users (food retail chains) are mainly concerned about the lack of experienced trainers, training programmes or educational material in West (Central and South) Europe.**

An interesting suggestion is given by a refrigeration system manufacturer, who recognises the lack of unbiased third party data to compare alternative technologies, as a very strong (5) knowledge barrier. This statement emphasizes the **need for a shared and repeatable methodology for comparing different systems under the same boundary conditions.**

According to **Error! Reference source not found.**, there is a general need for training all major food retail sector stakeholders all over Europe, with limited difference moving from North to South. In particular **servicing, repairing and maintenance staff rate the importance of training highly**, especially in South Europe (4.3): 11 % of the respondents attributed top score (5) to this category.

Table 6-6: Rating the importance to be trained about energy-efficient heating & cooling solutions by different stakeholders, from low importance (1) to high importance (5)

	Top score (%)	Average score (1-5)				
		North	Central West	Central East	South East	South West
Food retail chains and supermarket owners	8 %	3.6	3.6	3.7	3.7	3.7
System manufacturers and component suppliers HVAC&R	5 %	2.9	2.9	3.1	3.4	3.2
Consulting, contracting, engineering staff	9 %	3.8	3.9	4.2	4.0	4.0
Servicing, repair, maintenance staff	11 %	3.7	3.8	3.8	4.3	4.3

Regarding the importance of being trained, it is worth noting that some stakeholder groups underestimated their own need for training (they attributed a lower score to themselves than what they get in Table 6.6 as an average score by all respondents, which means they do not feel they need to be trained too much). For instance, servicing, repairing and maintenance staff rated 3.5 (vs 4.0) the importance of being trained, while attributing 4.4 to consulting, contracting and engineering staff (vs 3.9 average), who is probably considered responsible for the system design and complexity. On the other hand, consulting, contracting and engineering staff, being very convinced about the importance of being trained, attributed a score of 4.3 to themselves (vs 3.9 average)

System manufacturers and components suppliers in HVAC&R consider the importance of own training of being quite low (2.7), while they think it is very important to train both consulting, contracting and engineering on one hand, and servicing, repairing and maintenance staff on the other.

The general outcome is that it is **very important to train people who design, commission and service the plant** while there is **more confidence in the competence of single component suppliers or HVAC&R unit designers and producers.**

6.3.3 Social barrier

As shown in Table 6-7, the proposed social barriers are felt to gain in importance when moving South: there is an almost uniform increase of 0.8-1.0 points from North to South (West or East). The fear of not having sufficiently trained technicians, which was also identified by many respondents as a knowledge barrier, is considered to be the worst social barrier, especially in the South. This is similarly true for concerns about a long payback time for investments in energy efficiency measures. **Possible investment increase and long payback time get the most uniform score all over Europe.**

Table 6-7: Rating of proposed social barriers for energy efficient heating & cooling in the European food retail business, from weak barrier (1) to strong barrier (5)

	Top score (%)	Average score (1-5)				
		North	Central West	Central East	South East	South West
Concern about possible investment increase and long payback time	6 %	3.4	3.5	3.7	3.7	3.9
Concern about new solutions leading to too many technical changes at the same time	4 %	2.8	3.4	3.5	3.7	3.8
Concern about new systems being less reliable than H(C)FC ones	6 %	3.0	3.4	3.5	4.0	3.8
Concern that energy efficient systems do not perform as promised	4	3.0	3.2	3.2	3.5	3.9
Concern about higher maintenance for new solutions or increased installation time	4 %	2.9	3.1	3.4	3.4	3.7
Concern about availability of trained technicians for installation/maintenance of the new systems	7 %	3.2	3.3	3.4	4.1	4.0
Concern about consumers not valorising improved environmental impact of supermarkets	4 %	2.6	2.8	2.9	3.2	3.4

In the **South** there is also a general concern about new systems not performing as well as the old ones or not being equally reliable. This feeling might derive both from the concern about the region's low knowledge levels, as well as the hot climate which is a bigger challenge in the South than in the North.

Suggestions were provided by respondents about other social barriers: the creation of new personal relationship with new market players, i.e. the suppliers of energy efficient systems, is seen as a weak barrier in North (2) and Central West Europe (3) but definitively strong (5) in South West Europe, thus stating the higher importance of personal relationships in that region.

One respondent from the contracting, consulting and engineering group claims that energy efficiency might be perceived as a temporary fashion.

Financial conflict of interests was also proposed as a social barrier.

6.3.4 Organisational barrier

When presenting the organisational barrier (Table 6-8), top score to the proposed hindrances was provided mainly by components and system suppliers almost all over Europe: it means that **they feel somewhat unable to sell their products due to this kind of barriers**, which, according to its definition, mainly lies within the planning, building and running stores chain, rather than in the components and systems supply chain. On the other hand, the end users (food retail chains) do not consider these barriers particularly important, although they claim for rewarding/payback schemes to compensate for the initial and running costs.

Table 6-8: Rating the proposed organisational barriers for energy efficient heating & cooling in the European food retail business, from weak barrier (1) to strong barrier (5)

	Top score (%)	Average score (1-5)				
		North	Central West	Central East	South East	South West
Conflicting interests of stakeholders involved in planning or operating a supermarket	6 %	3.3	3.2	3.6	4.0	3.7
Lack of an "Energy Manager" for supermarket life time	5 %	3.0	3.0	3.4	3.7	3.5
Lack of distributed responsibility chain for setting up an "integrated, efficient solution"	3 %	2.9	3.0	3.3	3.6	3.4
Lack of an energy rewarding/payback scheme between system owner and system operator	6 %	3.1	3.3	3.4	3.9	3.8
Short term view for energy efficiency investments	6 %	3.3	3.2	3.8	3.6	3.5

6.3.5 Legislative barrier

As the legislative barrier is described as the lack of legislation considering the supermarket system as a whole and thus promoting energy efficient supermarkets as a whole or punishing inefficient ones, except for some regional/national experiences, questions of the major legislative EU acts promoting environmentally friendly technologies in the food retail HVAC&R systems are posed.

6.3.5.1 F-gas Regulation [European Commission, 2016a]

The European Union is acting to control emissions of fluorinated greenhouse gases (F-gases), including hydrofluorocarbons (HFCs) with the 'MAC Directive' for mobile air conditioning appliances and the 'F-gas Regulation' which covers all other key applications in which F-gases are used.

The MAC Directive (Directive 2006/40/EC of the European Parliament and of the Council of 17 May 2006 relating to emissions from air conditioning systems in motor vehicles and amending Council Directive 70/156/EEC) prohibits the use of F-gases with a Global Warming Potential (GWP) of more than 150 in new types of cars and vans (from 2011) and in all new cars and vans produced from 2017.

The F-gas Regulation adopts two actions, i.e. reducing the leaks from equipment containing F-gases and avoiding the use of F-gases where environmentally superior alternatives are cost-effective.

Adopted measures for leakage reduction include:

- containment of gases and proper recovery of equipment;
- training and certification of personnel and of companies handling these gases;
- labelling of equipment containing F-gases.

Reducing the use of F-gases is pursued by limiting the volume of HFCs which can be placed on the EU market from 2015 and by phasing down over time. In addition, measures include restrictions on the marketing and use of certain products and equipment containing F-gases.

The original F-gas Regulation (Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases) has been replaced in 2014 by a new Regulation (Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006) which applies from 1 January 2015. The new F-gas Regulation strengthens the existing measures by:

- limiting the total amount of the most important F-gases, the HFCs, that can be sold in the EU from 2015 onwards and phasing them down in steps to one-fifth of 2014 sales in 2030;
- **banning the use of F-gases in many new types of equipment where less harmful alternatives are widely available**, such as fridges in homes or supermarkets, air conditioning, foams and aerosols;

- preventing emissions of F-gases from existing equipment by requiring checks, proper servicing and recovery of the gases at the end of the equipment's life.

The ambition of the new Regulation is to cut the EU's F-gas emissions by two-thirds by 2030 compared with 2014 levels. According to [European Commission, 2016a] this reduction is achievable at relatively low cost because climate friendly alternatives are readily available for many of the products and equipment in which F-gases are commonly used today.

Questions were posed to food retail sector stakeholders to evaluate the impact of the new F-gas Regulation, which has been in operation for one and a half years so far, on their business. The results are presented in Table 6-9 for the different geographical regions.

Table 6-9: Rating the proposed challenges under the F-gas Regulation for energy efficient heating & cooling in the European food retail business, from weak challenge (1) to strong challenge (5)

	Top score (%)	Average score (1-5)				
		North	Central West	Central East	South East	South West
Complexity in record keeping for HFCs systems	4 %	2.8	2.8	3.0	3.1	3.5
Lack of qualified personnel for system servicing	4 %	2.8	3.2	3.4	3.5	3.7
Lack of awareness of possible alternatives to F-gases when planning the future installations	4 %	2.9	2.9	3.3	3.6	3.5
Lack of/limited availability of suppliers for HFC-free systems	2 %	2.4	2.5	2.8	3.0	2.9

The strongest barrier under the F-gas Regulation is identified in the **lack of qualified personnel for system servicing**, which is evaluated as being of importance **especially in South West Europe** (3.7). This barrier is somewhat classified as a **knowledge barrier** and many similarities can be found with the lack of qualified and experienced technicians that was claimed before. Top score (5) was mainly provided by components suppliers, while the group of servicing, repairing and maintenance staff, who is actually in charge of F-gas related activities, did not agree and stated an average score of 2.8, far below the average.

Also the lack of awareness of possible alternatives to HFCs is a medium strength barrier in South Europe and gets a score which is even higher than the awareness barrier for not knowing energy efficient technologies in general terms, presented in Section 6.3.1. Finally, there seems to be a good awareness level of the existence of suppliers for HFC-free systems.

Two respondents are proposing a pan-European taxation frame on F-gases to prevent black market, together with a stricter application of the F-gas Regulation.

6.3.5.2 EPBD Directive [European Commission, 2016b]

The 2010 Energy Performance of Buildings Directive EPBD (Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings) and the 2012 Energy Efficiency Directive (Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC) are the main EU legislative acts to reduce the energy consumption of buildings.

The EPBD requires that:

- energy performance certificates are included in all advertisements for the sale or rental of buildings;
- EU countries establish inspection schemes for heating and air conditioning systems or put in place measures with equivalent effect;
- all new buildings are nearly zero energy buildings by 31 December 2020 (public buildings by 31 December 2018);

- EU countries set minimum energy performance requirements for new buildings, for the major renovation of buildings and for the replacement or retrofit of building elements (heating and cooling systems, roofs, walls, etc.);
- EU countries have to draw up lists of national financial measures to improve the energy efficiency of buildings.

Questions were posed to food retail sector stakeholders to evaluate the impact of the EPBD on their business. The results are presented in Table 6-10.

Table 6-10: Rating the proposed challenges under EBPB for energy efficient heating & cooling in the European food retail business, from weak barrier (1) to strong barrier (5)

	Top score (%)	Average score (1-5)				
		North	Central West	Central East	South East	South West
Complexity in the legislative framework (EU vs national)	4 %	3.0	3.4	3.3	3.6	3.7
Complexity in the key roles for the Directive implementation (Local authorities, ESCOs, ...)	5 %	3.2	3.5	3.4	3.8	3.7
Lack of qualified designers and consultants	4 %	3.0	3.2	3.4	3.5	3.4
Unclear/Unstable energy price	2 %	2.5	3.1	3.3	3.0	2.9
Fear of increase in the required financial effort	5 %	3.0	3.4	3.3	3.3	3.9

The **complexity in the legislative framework** is considered an important barrier **all over Europe**, getting a quite high score (3.7) in South West Europe. An even higher score is given for complexity in the key roles/persons for the Directive implementation.

The rating for **lack of qualified designers and consultants** can be classified as a knowledge barrier. The fear for the **increase in the financial effort** is very high in **South West** Europe (3.9). It can be listed under the social barrier category. The concern about a possible increase in the investment cost and longer payback times, presented in Section 6.3.3, got almost the same scores. The top score (5) for this category comes from all stakeholders categories. The energy price does not seem to be a barrier anywhere in Europe.

6.4 EU Ecolabel

Some questions were posed to the involved respondents in order to understand the general feeling about a possible implementation of an EU Ecolabel for the food retail sector. This part of the survey was preparatory to the further specific questionnaire developed under the SuperSmart project entirely dedicated to the EU Ecolabel.

As reported in Table 6-11 the expected impact of the EU Ecolabelling on all the proposed items gets a quite **average score**, i.e. from 2.7-3.3 in a 1-5 range.

All respondents except food retail chains are quite **confident** that it could **improve their own financial success** and sales numbers. The cautious rating (2.4) given by food retail chains is very important, as they are supposed to be the final group implementing the Ecolabel and it well fits together with their feeling that the EU Ecolabel will provide almost no added value to their customers (2.2). They are, however, the most aware group regarding the impact on the carbon footprint of their services (3.8); they believe that the Ecolabel would not overload too much their everyday workload and they are aware of the need for training for their staff. System manufacturers and components suppliers are quite positive with respect to the impact of the EU Ecolabel on sales numbers and the added value of their products. They also seem to be quite ready for the label, as they do not foresee too much impact on the need for training or everyday workload. Servicing, repairing and maintenance stakeholders think that the EU Ecolabel could have an impact (3.3) on the carbon footprint of their services and that it will require more training for themselves, although the impact on their workload won't be so relevant. Associations are very cautious and they do not think that the EU Ecolabel might have any significant impact on any of the proposed items. On the

contrary, universities and research institutes give very high scores, imagining an important influence of the EU Ecolabel on their financial success through the added value they can provide. They also suspect a high increase in training they will need.

Table 6-11: Rating of the impact of EU Ecolabelling on the food retail sector

	Average score (%)	Average score (1-5)							
		Food retail chains	System manufacturer HVAC	System manufacture Refrigeration	Components supplier	Consulting, contracting engineering	Servicing, repair, maintenance	Association	University and Research Institute
My food retail business	3.0	3.0							
The European food retail sector in general	3.2	3.0	2.8	2.8	3.1	3.4	2.9	2.5	3.6
The carbon footprint of my products and services	3.3	3.8	3.0	3.1	3.0	3.2	3.3	2.4	3.4
My financial success / sales numbers	3.1	2.4	3.3	3.2	2.8	3.3	2.8	2.4	3.8
The value added I can provide to my customers and partners	3.2	2.2	3.3	3.3	3.1	3.2	3.1	2.4	3.9
The additional training needs for my staff members	3.0	3.2	2.2	2.6	2.8	3.1	3.1	2.2	4.0
My every day workload	2.7	2.0	1.8	2.4	2.6	2.8	2.6	1.8	2.9

Specific questions were asked on the EU Ecolabel to **food retail chains**, to understand their willingness to apply for a future EU Ecolabel. Only 4 respondents provided their opinion on this topic. 50 % of them declared their **positive attitude** towards the application for the Ecolabel to their existing food stores; the concerns of those who are negative are related to the fact that they imagine the procedure to obtain and maintain the Ecolabel to be long, complex and costly, but they also think that their actual systems are too old or would not meet energy efficiency requirements. On the other hand, 100 % of food retail chains respondents are willing to apply for the EU Ecolabel in the case of new or refurbished stores.

6.5 Interest in SuperSmart

The interest in the SuperSmart project was high amongst respondents: near **80 %** of them **declared the willingness to be kept informed about the survey results and the project progress.**

When coming to active participation, **62 % of respondents are interested in participating more actively in the project** by being involved in the expert panels, thus influencing the uptake of efficient heating and cooling technology in the food retail sector and the introduction of an EU Ecolabel for food retail stores.

The percentage of interest in the food retail sector is near 100 %, while the largest number of respondents not willing to be actively involved lies in the refrigeration systems manufacturer group.

6.6 Best practice and pilot plants

Respondents reacted very actively when asked to provide best practice examples, pilot installations or to quote sources of further information (links to websites, names of organisations, email addresses) that can demonstrate improvements in energy efficiency and in environmental impact in food retail stores. 38 suggestions were provided during the survey, to be evaluated and studied by project partners.

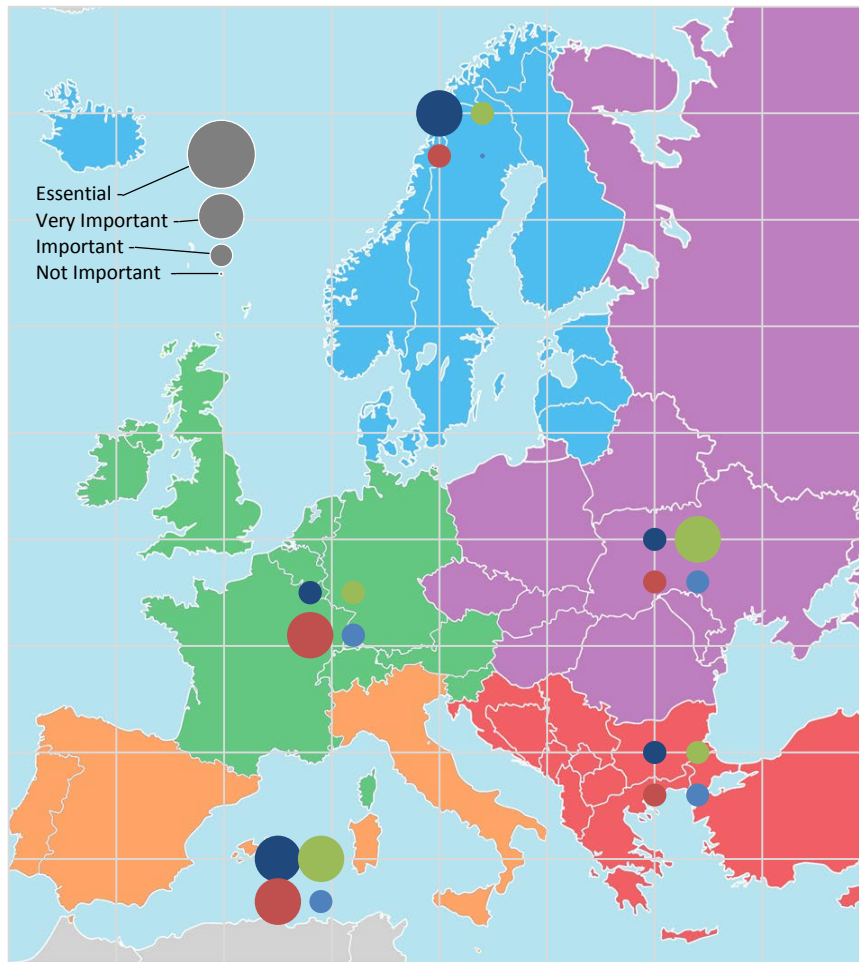
7 CONCLUSIONS AND SUGGESTIONS

The interest in low carbon technologies for the food retail stores is widespread across Europe and amongst all identified stakeholders. While **industrial stakeholders** (HVAC&R systems and components manufacturers and suppliers) **are approached at the technical level**, food retail chains are more difficult to be involved, and the participation has to occur at **managerial level**.

Energy efficiency is important for the business of all involved stakeholders, and it acquires top relevance for food retail chains. There is already a general experience in energy efficient technologies (LED lighting, doors on display cases, heat recovery), in renewables (mainly air source heat pumps) and in the use of natural refrigerants (CO₂ and HCs). Wide experience in energy efficiency has been gained in refrigeration technology.

When analysing non-technological barriers, there is a general increasing trend in the perceived obstacles when moving from North to South; this is valid for all proposed barriers and stakeholders. Major conclusions and suggestions for removing each of the non-technological barriers are reported in the figures below.

Awareness barrier



- Improve the awareness of available technology at decision making level
- Promote awareness of financial support (by banks, financial bodies or govt funding) or reward schemes for energy efficiency
- Promote awareness of possible financial savings from energy efficient solutions
- Stimulate awareness of the environmental benefit of energy efficient systems

Figure 7-1: Suggested actions to remove the awareness barrier throughout Europe.

Knowledge barrier

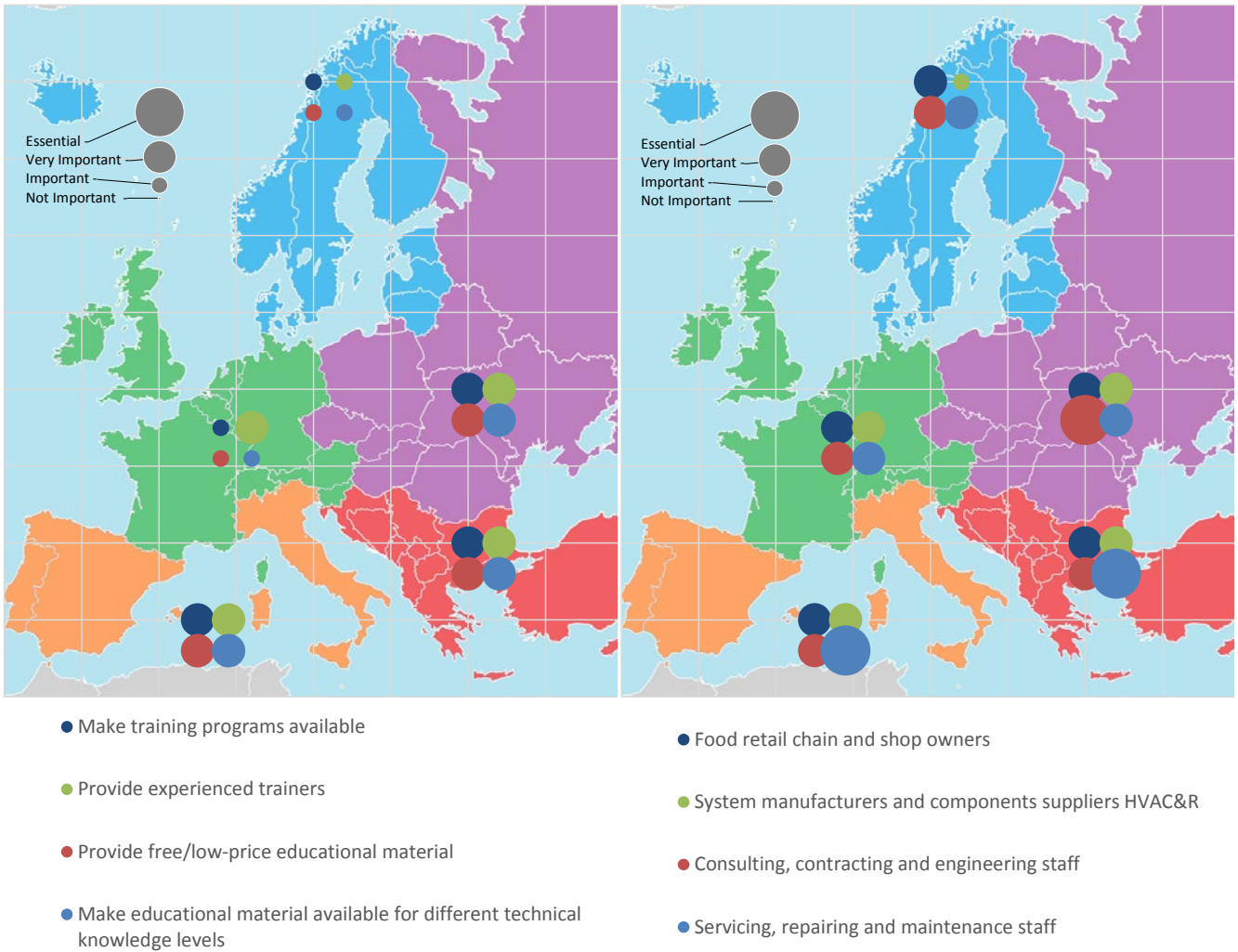
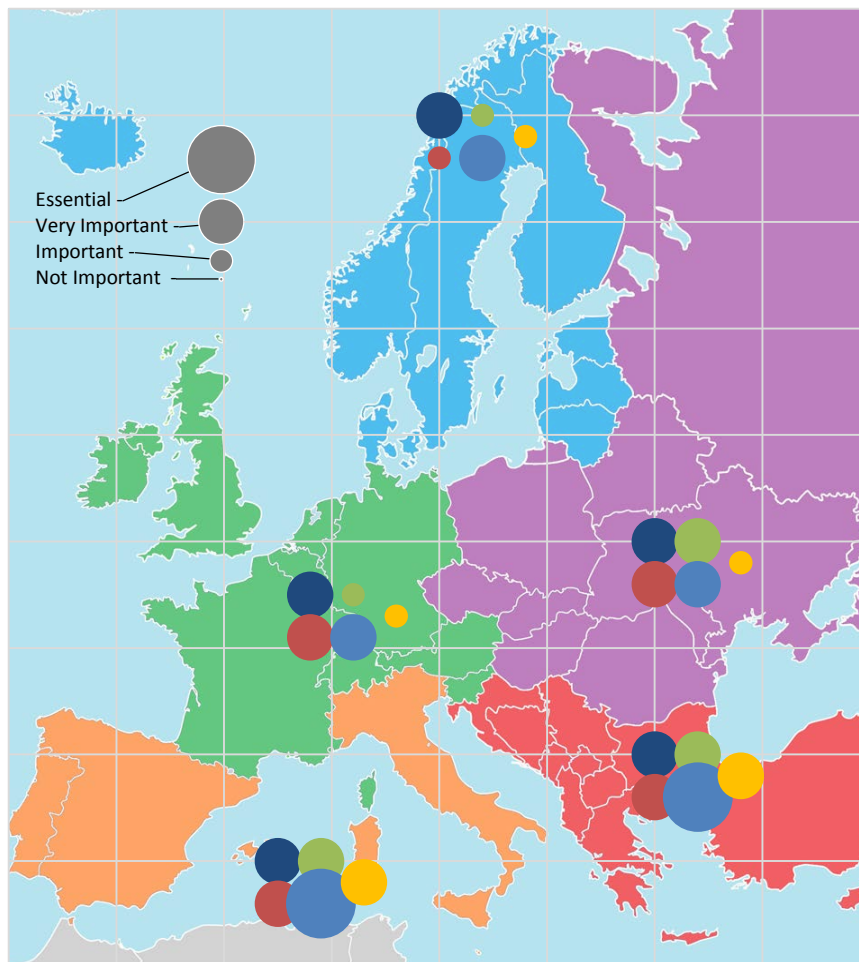


Figure 7-2: Suggested actions to remove the knowledge barrier

Figure 7-3: People to be trained to successfully remove the knowledge barrier

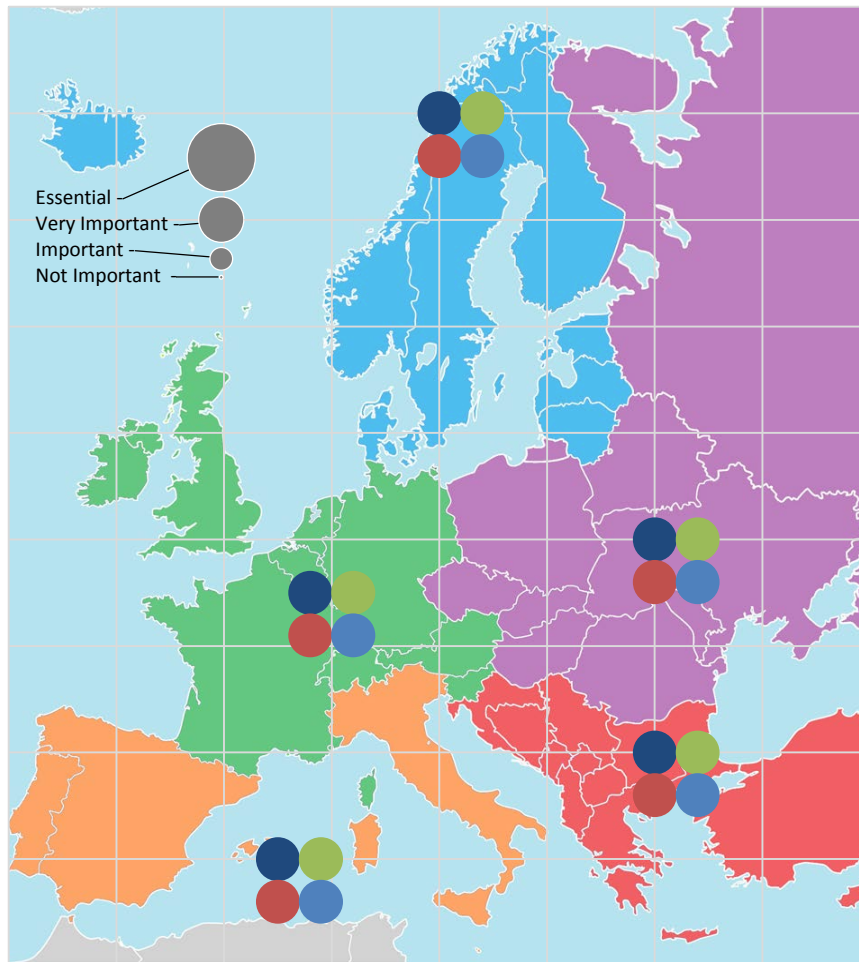
Social barrier



- Possible investment increase and long payback time/ too many technical changes at the same time
- New systems being less reliable than H(C)FC ones or not performing as promised
- Higher maintenance for new solutions or increased installation time
- About availability of trained technicians for installation/maintenance of the new systems
- Consumers not valorising improved environmental impact of supermarkets

Figure 7-4: Suggested actions to remove the social barrier: Remove/reduce the concern about...

Organisational barrier



- Propose methodology to make interests of stakeholders involved in planning or operating a supermarket converge and/or define and propose an energy rewarding/payback scheme between system owner and system operator
- Promote the introduction of “Energy Manager for supermarket life time

Figure 7-5: Suggested actions to remove the organisational barrier



F-gas Regulation

The strongest barrier under the F-gas Regulation is identified in the **lack of qualified personnel for system servicing**, which is evaluated quite impeding **especially in South West Europe**. This barrier can be classified as a knowledge barrier and **training for involved stakeholders** is to be considered as a countermeasure.

EPBD Directive

The **complication of the legislative framework (EU vs national)** and the **complexity in the key roles for the Directive implementation** are classified as very important barriers all over Europe, with particularly high emphasis in the Southern areas. Within the scope of SuperSmart, training on the local and EU legislative instruments and on the roles of local authorities and energy service companies (ESCOs) should be provided all over Europe to overcome this knowledge barrier. **Specific training** should also be supplied to designers and consultants.

All over Europe, stakeholders fear a possible increase in the financial effort (social barrier). The suggested action is to **provide practical examples** to dismantle this alarm and to valorise the economic benefits in running costs deriving from Directive implementation with **specific best practice examples** from the field.

8 SUMMARY

An online questionnaire was submitted to stakeholders within the European food retail sector, with special focus on target groups related to energy systems (HVAC&R). The scope of the survey was identifying their attitudes towards energy efficiency, obstacles to the adoption of state-of-the-art technology, approaches to existing regulatory instruments (F-gas Regulation and EPBD Directive) and feelings towards a future EU Ecolabel.

178 valid questionnaires were collected online and during a dedicated workshop held in Barcelona (Spain) in April 2016. **Industrial target groups** (HVAC&R manufacturers and components suppliers) are very well represented: 73 % of the respondents belong to one of these groups. Services (consulting, contracting, engineering and servicing, repair, maintenance) totalize 31 % of the respondents. Representation of associations is quite limited, 4 %, while the research and academic group is numerous (16 %). The **representation of food retail chains** (11) and single shop owners (1) is not so strong; however, some of the respondents claim to run a huge number of stores (up to 1200), spread all over Europe, so their answers are considered to be representative for the sector.

The highest number (52 %) of responses came from **managers**, while the second highest (35 %) came from the **technical area** (designers, researchers, technicians).

The entire Europe is well represented in the survey answers, with a special emphasis on **North, Central and South West Europe**.

The general **attitude towards energy efficiency is very positive** throughout all the stakeholder groups. The closer the stakeholder is to the final complete installation, the higher is the importance given to energy efficiency: all food retail chain respondents gave 5 stars (top score) when asked how important energy efficiency is for their business, while only 41 % of components suppliers did the same.

The level of **experience in energy efficiency and low carbon technologies is generally high**: 70 % of respondents apply heat recovery, 60 % utilize renewable energy sources, and 81 % apply CO₂ as a refrigerant. The refrigeration sector seems the one undergoing the most widespread energy efficiency improvement process.

When presenting the non-technological barriers, there was always an **increase in the perceived obstacle in each barrier when moving from North to South**. All the proposed barriers get a “medium” impact score, ranging from 2.5 to 3.5 in a 1-5 range. The **legislative barrier is considered the most difficult to remove**, together with the social one, although they are not classified as the most impeding ones. **Awareness and knowledge barriers are evaluated as the easiest to remove**. The **social barrier** is considered the one that, once removed, **could have the highest positive impact**; the second most positive impact would be obtained by removing organisational and awareness barriers. **Financial incentives** are suggested as a possibility to promote energy efficiency in the food retail sector and initial cost as a barrier. The lack of awareness of financial support to implement energy efficiency measures seems to be the most important **awareness barrier**, especially in South-West Europe.

The **lack of experienced trainers** is considered the **knowledge barrier with the highest impact** amongst the proposed ones. While in the North the greatest burden of the knowledge barrier is recognised by consultants, contracting and engineering respondents, in the rest of Europe the top score is provided by refrigeration systems manufacturers and components suppliers. End users (food retail chains) are mainly concerned about the lack of experienced trainers, training programmes or educational material in West (Central and South) Europe. Servicing, repairing and maintenance staff seem to be the key persons to be trained, especially in South Europe.

The fear of not having sufficiently trained technicians, which is also recognised as a knowledge barrier, is considered the worst **social barrier**, especially in the South, together with the concern about long payback time for the investments required by energy efficiency. In the South, there is also a general concern about new systems not performing as well as the old ones or not being equally reliable.

The **organisational barrier** is perceived as a drawback mainly by components and system suppliers, all over Europe: it means that they feel somewhat unable of selling their products due to this kind of barrier, which mainly lies within the planning, building and running stores chain, rather than in the components and



systems supply chain. On the other hand, the end users (food retail chains) do not evaluate these barriers to be particularly important.

When moving to **legislative barriers**, the strongest obstacle under the **F-gas Regulation** is identified in the lack of qualified personnel for system servicing, which is evaluated to have a negative impact especially in South West Europe. This barrier can be also classified as a knowledge barrier.

As far as **EPBD** is concerned, the complexity in the legislative framework is considered an important barrier all over Europe, in particular in South West Europe. Identifying key roles/persons for the Directive implementation is perceived even more complex. There is also a general perception of lack of qualified designers and consultants to implement the EPBD, which might be classified as a knowledge barrier. Concerns about an increase in the financial effort, which can be classified as a social barrier, is very high in South West Europe (3.9).

9 REFERENCES

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