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Deliverable 6.2 – Promoting Market Up-Take Measures

Practical Procedures, Recommendations and Guidelines Report

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1. INTRODUCTION

The ee-WiSE Project has been approved in the 2012 FP7 call, within the Theme: Methodologies for Knowledge Transfer within the Value Chain and particularly on SMEs and consists of an international consortium of 13 partners including research institutes, companies (also SMEs), universities and public entities from 7 different countries in the Mediterranean area. The main purpose of the ee-WiSE project was to develop a Framework for Knowledge Management and Transfer within the EE building retrofitting value chain in the Mediterranean, and with special attention to SMEs. The project has been designed to achieve three main goals:

1) to reach the European Energy Efficiency (EE) targets,
2) to promote the building retrofitting sector, and
3) to foster knowledge transfer within agents of the value chain.

The present deliverable is expected to provide a framework of practical procedures, recommendations and guidelines underlining knowledge transfer within the value chain and particularly for SMEs. For this reason it presents the current situation regarding energy efficiency, describes the aims and goals of the ee-WiSE project in this context, and proposes a specific methodological approach for knowledge management and transfer within the EE building retrofitting value chain in the Mediterranean.

1.1. Field of application - Scope

Figure 1 Mediterranean basin

This document's key goal is to stimulate retrofit market activities that move beyond traditional public awareness campaigns, program maintenance, demonstration projects, and other "one-time" strategies and projects. Specifically, this deliverable seeks to fill the gap in knowledge transfer activities and investments that are prevalent in the retrofitting market in ways which can fundamentally and permanently transform energy markets in the Mediterranean region in a way that make retrofitting and energy efficiency the options of first choice, together with establishing a self-sustaining retrofit market. This document is designed to overcome one of the major barriers to adoption of potential retrofitting measures by providing access to information, and access to skilled workers. This is expected to enable retrofit companies and other complementary industries to increase their capacity to serve the Mediterranean markets better, while providing the necessary economies of scale and market

competition that can drive down the cost of products/services and establish a more sustainable retrofit market. So while the field of application is focused primarily towards Mediterranean organisations involved in the retrofitting market, the majority of issues raised and addressed also have relevance to the rest of the European market.

1.2. The ee-WiSE: A tool for knowledge transfer improvement across the value chain

The Energy Efficiency sector is expected to experience momentum through an increase in the retrofitting activity since rehabilitation of the existing building stock can provide more energy efficiency opportunities compared to that of new buildings[1]. The existing buildings' energy impact must be reduced in order to reduce the final CO2 emissions resulting from the buildings' energy consumption. Unfortunately the Energy Efficient Retrofitting knowledge generated over the years by the value chain agents involved has not been managed correctly and consequently knowledge transfer actions are practically inexistent. There are a small number of identified processes currently active throughout the Mediterranean countries that boost Knowledge Transfer in order to promote the EE sector[2]. In a real scenario, the knowledge generated in the EE sector should result in added benefits across the value chain[3]. This turns out to be the main problem of the EE sector: knowledge transfer is not effective between the different agents of the value chain. Therefore the questions that need to be answered are:

- Why do the knowledge and policies applicability not flow to all Value Chain Agents?
- Why do most companies operating in the field of building retrofitting ignore such policies, and even worse, do not respond to the demand from users in terms of improving energy efficiency in their homes?

It is vital to determine where the system failures or weakness in the KT are, that prevent existing knowledge, both from a technical and an economic-social point of view, to come to the companies so these can take the important role they deserve to encourage energy efficiency improvements in buildings.

The main objective of ee-WiSE is to develop a Framework for Knowledge Management and Knowledge Transfer within the energy efficient building retrofitting value chain with special attention to SMEs in the Mediterranean Area. ee-WiSE has identified, through a complex methodology, the critical points of this knowledge transfer (**KT**) flows, in order to act on its breakpoints. The combination of a phase of analytical work and another of Knowledge Transfer Framework design and validation will provide the industry with a valuable tool to help improve the EE market. The main output of the project is the creation of a Knowledge Transfer Tool that introduces a Knowledge Transfer methodology focused on building retrofitting within the value chain, to enhance the Energy Efficiency's Market in the Mediterranean area.

The main advantages of the Knowledge Transfer Framework are:

[1] http://www.economistinsights.com/sites/default/files/downloads/EIU_GBPN_EnergyEfficiency_120921r3.pdf
[2] http://energies2050.org/wp-content/uploads/2014/03/2014-03-14-Final-Agenda_Round-Table_Johnson-Controls.pdf
[3] http://www.ener2i.eu/related_projects/r2i_cluster_mediterranean

- It improves the knowledge flow throughout the Value Chain, thus ensuring that the companies participate in sharing and usage of the current research knowledge, providing a solution to what the user requires through designers and prescribers.
- Moreover, it enhances the value of tested functional and cost-effective construction solutions/materials already offered by producers.
- It offers a tool for the different administrations that can be used to coordinate the development of regulations in their competence levels and control mechanisms of compliance with uniform and objective criteria.
- By including certification bodies, this project takes into consideration an agent that just validates building companies' accomplishment in terms of energy efficiency to the administration authorities, financial institutions and of course the end user.

1.3. The Approach

The methodology developed for carrying out the ee-WiSE project followed a logical progression in which each specific objective was tackled within a work package (WP) of works.

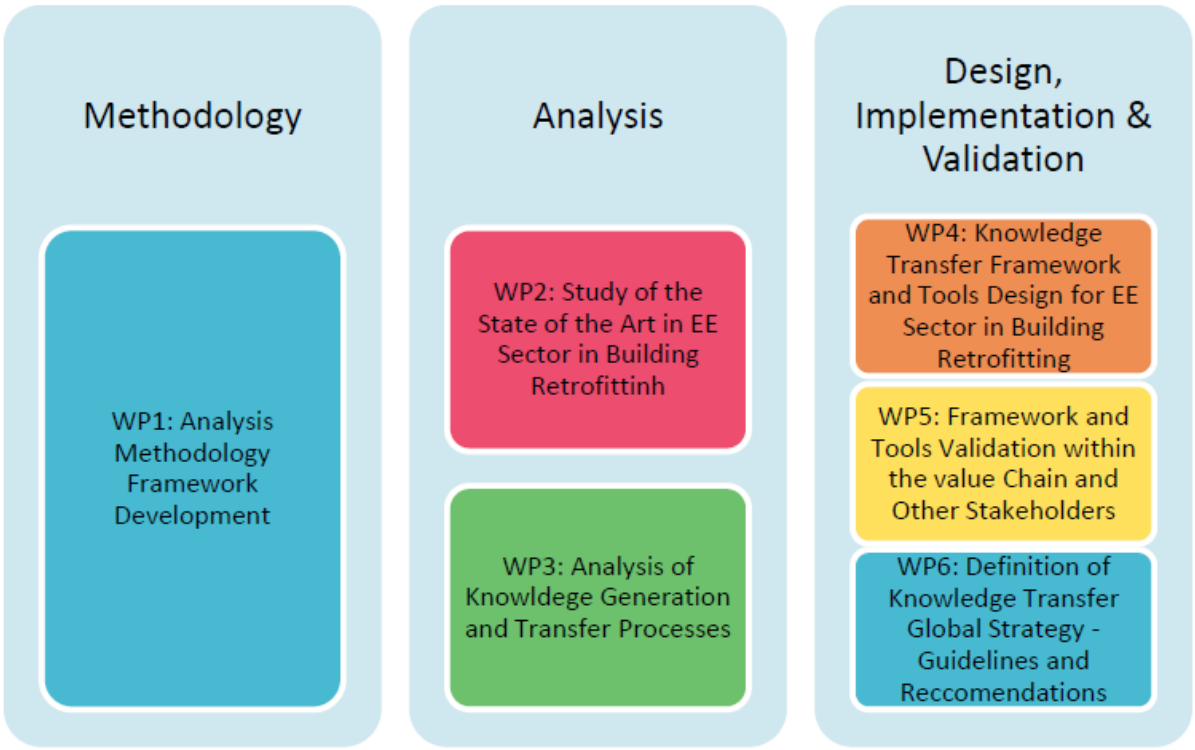

Figure 2 The ee-WiSE project stages

More in detail:

- **<u>Work package 1: Analysis Methodology Framework Development</u>**

The goals of this WP were to identify a solid methodology for determining the most effective procedures for conceptualizing the items that will be studied; a set of optimal tools for undertaking the analysis of each designed concept, and a methodological frame which constituted an integrated tool containing all the data captured during the analysis phase. The main deliverable of the specific Work

Package was a Methodological framework with tools for data collection of relevant information, providing a systematic set of procedures for the scientific and technical coordination and management of the project. Additionally, it included the description of the value chain, as well as the related concepts with respect to the value chain and energy efficiency in a Mediterranean climate.

- **Work package 2: Study of the state of the art in the EE sector in building retrofitting**

The goals of this WP were: a) compilation and study of current situation in knowledge transfer processes and practices in the EE sector in building retrofitting with special attention to aspects concerning SMEs and b) an identification of current underlying knowledge transfer processes, between agents of the value chain, detecting existing gaps. WP2 yielded two deliverables: a State-of-the-Art Base Report and a Knowledge Transfer Flows Analysis Report. The State of the Art Base Report of the current situation provided evidence on the global status of Knowledge in the EE sector and the Knowledge Transfer Processes Analysis report showed through a Knowledge Transfer Flows Map its real state and its breakpoints, including a SWOT analysis.

- **Work package 3: Analysis of knowledge generation and transfer processes**

The main goal of this WP was to determine the framework conditions and specific support agents required in order to successfully activate the sector. In addition, the most important needs and barriers hindering or enabling knowledge transfer were identified for each individual value chain group, by means of a consultation process that involved the value chain agents themselves and that produced a ranked list of knowledge transfer needs. The main deliverable was a Knowledge Generation and Transfer Processes Report that identified the major stumbling blocks and required solutions to overcome the lack of knowledge transfer flow in the retrofitting value chain, and also included a detailed inventory of best practices.

- **Work Package 4: Knowledge Transfer Framework and Tools Design for EE Sector in Building Retrofitting**

The goals of this WP were a) to establish a solid methodology as a way to find the best procedures to conceptualize the items that will be studied, b) to design optimal tools to undertake the analysis of each designed concept, c) to develop a methodological frame which will be able to create an integrated tool that stores all the data captured during the analysis phase and finally, to ensure the active participation of all stakeholders providing the project co-creative capacity. The above goals have been fulfilled through two main deliverables, D4.1 ee-Wise KTF Design and D4.2 Virtual Knowledge Transfer Tool Description. Task 4.1 dealt with the design and implementation of the KT platform. The design took into consideration the material designed in Deliverable 4.2 together with a web platform for allowing users to upload content as providers and search and view content as receivers.

- **Work Package 5: Framework and Tools Validation within the value Chain and Other Stakeholders**

The main goal of WP5 was to get feedback from the representatives of the value chain through an iterative workshop process which validated the adequacy of the knowledge transfer framework and knowledge management tools developed in the previous WPs. A Framework and Knowledge Management Tools Validation Plan was developed (Deliverable 5.1) to set out the methodology, planning and monitoring of the validation activities. The Knowledge Transfer Framework, Knowledge Transfer Guidelines and ICT tools developed in WP4 were validated using a two-level approach, where the validation actions were implemented on a country level, as well as on a consortium level. During the primary validation phase, the developed KTF, guidelines and Tools were presented to the target audience – agents of the value chain – in workshops in each of the partner countries. The regional workshops were followed by the consortium-level workshop, aimed to validate the developed knowledge transfer framework. The results of the validation actions were used to develop the Validation report and conclusions, which was the second deliverable of Work Package 5. The Report

included an Enhancement Plan with a number of recommendations for improvement of the Knowledge Transfer Tool (KTF). Most recommendations were implemented before the end of WP5 and a new improved version of the KTF was released.

- **WP6 "Definition of the Knowledge Transfer Global Strategy: Guidelines and Recommendations"**

WP6 was based on:

a) On the theoretical know-how gained from WP2 and WP3,

b) On the development of KT Framework and KT Tool developed WP4 and

c) On the practical based evidences obtained through WP5 validation experiences.

The objectives of work package 6 were:

- Define a set of Knowledge Transfer Processes regarding the main milestones in Knowledge management, according to the sector's needs and the situation deriving from previous WPs, to enhance contact and communication between agents of the value chain and develop their intellectual capital for productive knowledge sharing and usage.
- Based on the study and analysis of best practices and evidence gathered through validation activities "Recommendations and Guidelines will be developed for the sector".
- Uptake of tacit knowledge implicit within the Sector's value chain.

1.3.1. The Deliverables

Work Package 6 deliverables are:

- D6.1: Business Models: Practical procedures, recommendations and Guidelines Report
- D6.2: Promoting Market up-taking measures: Practical procedures, recommendations and Guidelines Report
- D6.3: Enhancing Cross-Sectorial Cooperation: Practical procedures, recommendations and Guidelines Report
- D6.4: Standardization, Public Procurement and Certification: Practical procedures, recommendations and Guidelines Report

Each of those deliverables answers:

a) Knowledge Generation: How to generate new knowledge
b) Knowledge Sharing: How to effectively share this knowledge
c) Knowledge Dissemination: How to disseminate and use the knowledge with maximal effect

The four deliverables address these issues from the perspective of all agents with special attention to:

A. policy recommendations concerning the promotion and support for sustainable business models
B. successful development of multi-skilled SMEs' partnerships

Analysis of the Deliverables

- **D6.1: Business Models: Practical procedures, recommendations and Guidelines Report**

Definition: "A business model" describes the method or means by which the different value chain agents will transform the knowledge gathered into creating a profitable business. Business models are an essential part of strategy formation – they provide the fundamental link between product markets within the industry, and the markets for the factors of production. A business model may be based on many different aspects of the accumulated knowledge while concentrating on value creation.

- **D6.2: Promoting Market uptake measures: Practical procedures, recommendations and Guidelines Report**

Definition: "Market Up-Take" is the rate or extent to which EE Retrofit technologies are implemented in a country or region. A successful market up-take depends on how well the building owners and building managers respond to the retrofit technologies showcased to them. It involves a change in the society's behaviour and readiness to learn about and implement new technologies into their everyday life.

- **D6.3: Enhancing Cross-Sectorial Cooperation: Practical procedures, recommendations and Guidelines Report**

Definition: Cross-sectorial cooperation as applied to the EE retrofitting sector is the interaction between the professional agents of the value chain that are involved in technical and innovative developments. A good cooperation amongst agents will lead to an effective knowledge sharing, dissemination or generation, and thus a promotion of the competitiveness of the sector.

- **D6.4: Standardization, Public Procurement and Certification: Practical procedures, recommendations and Guidelines Report**

Definition: "standardization, public procurement and certification" are the processes that Public Bodies are directly involved in within the energy retrofitting sector. These agents range from Administration and Regulation Organisms, to Certifying Entities being responsible for the development of the legal framework and the creation of other type of requirements which can affect the market.

1.4. Difference between Deliverables 6.1 – 6.2 – 6.3 – 6.4

Practical Procedures, Guidelines and Recommendations for...			
Business Models (D.6.1) Identifies the opportunities and obstacles existing in the process of knowledge transfer within the retrofitting market and provides a step by step guide on how to create business models for the examined sector.	**Promoting Market Up-take (D.6.2)** Identifies the best ways to bring the EE Retrofit technologies and relevant knowledge to the market via strategic communication and methods to effectively increase knowledge transfer flows between the value chain agents.	**Enhancing Cross-Sectorial Cooperation (D.6.3)** Identifies the best cooperation strategies to overcome knowledge transfer gaps between the value chain agents and foster the sector's development and innovation, as a result of this interaction.	**Standardization, Public Procurement and Certification (D.6.4)** Deals with the processes that Public Bodies are directly involved within the EE retrofitting sector. These agents are from Administration and Regulation Organisms to Certifying Entities as the responsible of the development of the legal framework and the creation of other type of requirements which can affect the market. Knowledge and ideas generation, knowledge sharing and knowledge dissemination and use involves different agents of the Value Chain.

Table 1 Objective of each WP6 Deliverable

Deliverable 6.2 in this document is the direct outcome of Task 6.2 from WP6 that relates to the provision of guidelines for the value chain agents to enable them to better face Knowledge Transfer issues in the EE sector regarding building retrofitting, and the promotion of EE market up-take development. The document adopts a threefold approach of i) new knowledge and ideas generation, ii) knowledge sharing, and iii) knowledge dissemination and use in order to provide a set of practical procedures in order to enhance current markets for energy efficient retrofitting. Evidence-based recommendations and guidelines are also being proposed, taking into account the different profiles of involved agents. Special attention is being paid to measures derived from the review of best practices, practices that encourage investment in energy saving measures, methods that detect and transfer best innovative EE techniques and solutions, as well as those that promote latent demand (this refers to an established phenomenon that after supply increases, more of a good is consumed). Also recommendations about a communication plan to society are being proposed, in order to raise public awareness about the importance of energy efficiency in homes, while establishing society as an important player in the market.

2. METHODOLOGICAL APPROACH

2.1. Agents Definition

In the first phase of ee-WiSE, a full analysis of the EE Retrofitting Sector Value Chain was undertaken in order to ensure a full and complete common understanding of the issues at hand. The value chain key players are classified in the chart below according to their roles in the retrofitting flow chart. From left to right, each actor plays their role in the EE retrofitting flow chart in one or some of the stages; analysis of current conditions, methodology, application and/or verification, respectively. All these players have also top to bottom or vice versa dependencies to each other while playing their role in the flow chart. Additionally, in this value chain graph, the key players role is described as being a value chain main actor, or as a service provider or as being in the enabling environment is also shown in different colours as well as they are located in different areas of the value chain.

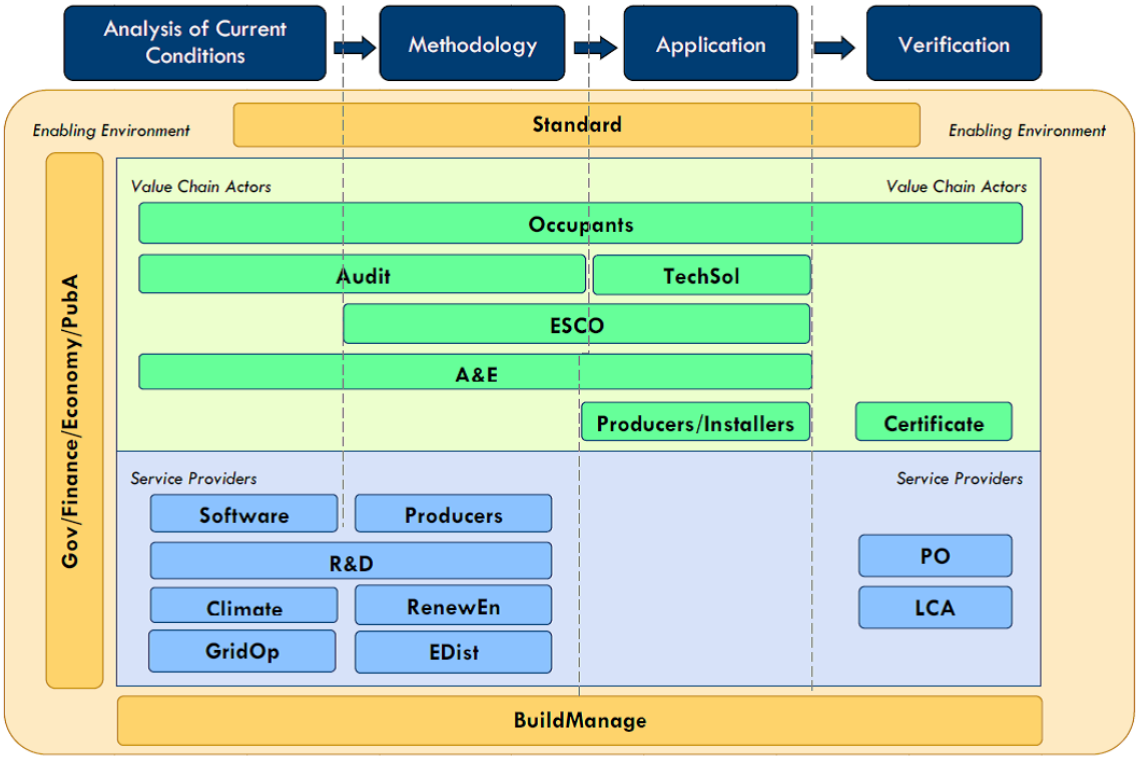

Figure 3 Energy Efficiency Retrofitting Sector's Value Chain

Abbreviations used in the Value Chain Graph

- **A&E:** Architecture and engineering companies (civil, mechanical, electrical, environmental),
- **Audit:** Energy auditing firms,
- **Build Manager:** Real Estate agents and householders and building managers,
- **Certificate:** Certification bodies,
- **Climate:** Meteorologists,
- **Economy:** Economists,
- **EDist:** Energy distributors,
- **ESCO:** Energy service companies,

- **Finance:** Banks, Financial Agents, Promoters, Subsidizers,
- **Government:** Government,
- **GridOp:** Electric Power Transmission Grid Operators (GridOp)
- **Installers:** Installers of building systems, building materials,
- **LCA:** Life cycle assessment bodies,
- **Occupants:** Homeowners and building users, occupants,
- **PO:** Intellectual property bodies and patent offices.
- **Manufacturers:** Manufacturers of building elements, building materials,
- **PubA:** Public administration and authorities (ministries, municipalities, etc.),
- **R&D:** R&D institutes, universities,
- **RenewEn:** Renewable energy companies,
- **Software:** Software developers,
- **Standard:** Standardization bodies,
- **TechSol:** Technical solutions developers companies.

Definitions:

1. **Financial Agents:** These are the Banks, Promoters, Subsidizers and other financial institutions financing green entrepreneurship as well as EE retrofitting projects.
2. **Public Administration and Government:** They act as policy makers, facilitate EE Building Retrofitting initiatives, and play a role in the development of green entrepreneurship on materials and services, etc.
3. **Standardization bodies:** They are the organizations whose primary activities are producing technical standards relevant to EE retrofitting.
4. **Software developers:** They design software for estimating the energy consumption of buildings, EE performance simulation and monitoring purposes.
5. **R&D Institutes and Universities:** These are consultants, researchers, and building scientists who produce the scientific knowledge and direct the policies.
6. **Installers:** They install the EE retrofitting measures to buildings; they need to have an idea about novel developments in the sector.
7. **Meteorologists:** The climate, and thus regulations, varies from one country to another. These actors evaluate and direct EE retrofitting actions according to different climate zones analysis.
8. **Manufacturers:** Their work is to produce building elements/materials and the fixtures for these elements which are mainly used for EE retrofitting.
9. **Technical solutions:** These actors develop and provide innovative services and design retrofitting measures for buildings. Basically the implementation of EE retrofitting ideas is done by these experts.
10. **Renewable energy:** Companies that produce energy from renewable sources, solar, wind, hydraulic, geothermal, biomass, etc.
11. **Energy distributors:** They are responsible for transporting energy to final customers or to distribution stations that sell energy to final customers.
12. **Grid Operators:** They build, maintain and provide the necessary energy network. It is possible to measure and evaluate the regional, national or International energy consumption trends to evaluate the EE retrofitting actions.
13. **Architecture and Engineering (A&E):** Generally address building energy issues within new construction, renovation and retrofitting projects. Their mission is to ensure that the buildings are constructed and/or renovated meeting the standards and building plan specifications.
14. **Energy Service Companies (ESCO):** They provide energy services and energy efficient improvement measures for building retrofitting.
15. **Energy Audit Firms:** They obtain adequate knowledge of the existing energy consumption profile of buildings, identify and quantify cost-effective energy saving opportunities and report the findings.

16. **Intellectual Property Bodies (Patent):** They are responsible for examining and issuing or rejecting patents, designs and trademarks. Protection of IPR is very important for EE retrofitting area, as there are various novel research findings.
17. **Life Cycle Assessment companies (LCA):** They evaluate the total energy consumed in all steps from acquisition of the raw material to end product step and assess the sustainability of the buildings.
18. **Certification bodies:** They provide energy performance certification. They rate the buildings on how efficient (or inefficient) they are in accordance with the certification definitions given in the standards.
19. **Building managers:** Literally, they are the financial owners of the buildings or managers of building groups. They are the ones who provide support from the government or from financial agents.
20. **Occupants:** They are the users of the building and they need to be living in energy efficient, healthy and comfortable environments.

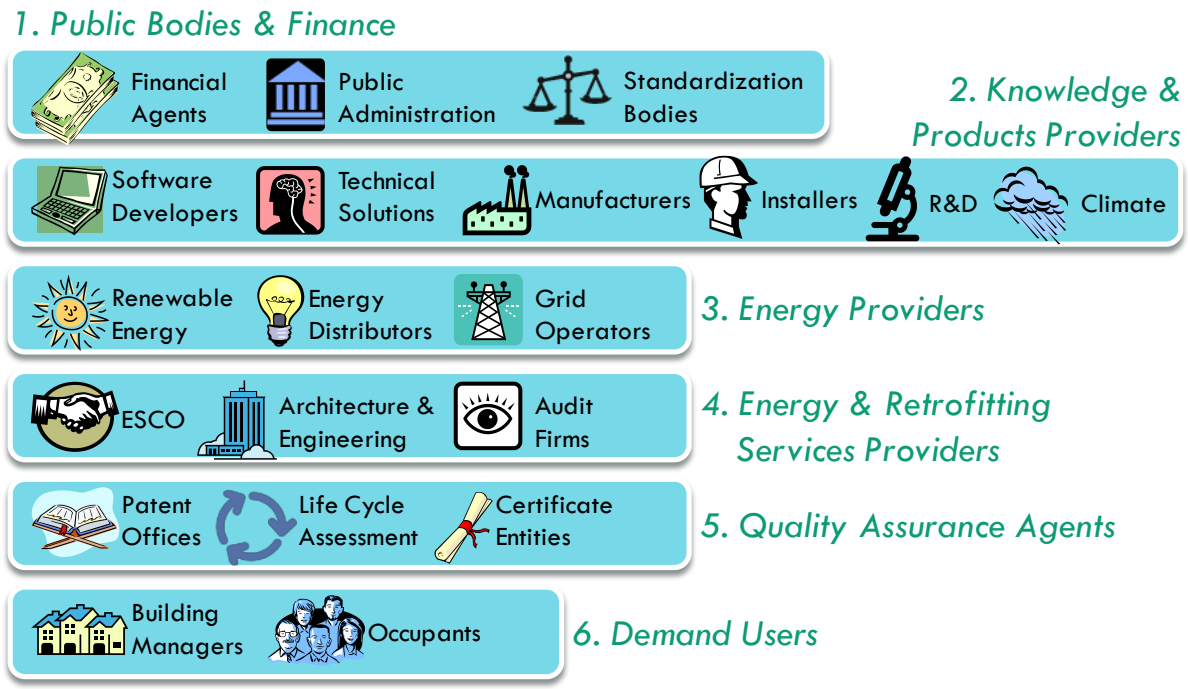

Figure 4 Value Chain Agents classified into Groups

2.2. Needs Category Definition

Based on the classification of WP1 & WP2, extensive research was carried out in WP3 with the objective to classify the needs for effective knowledge transfer through the retrofitting value chain into groups as is shown in Figure 5. These needs, as identified through the desk research, were categorised into groups related to:

A. Skills & Awareness
B. Knowledge Management
C. Approach to R&D
D. Financial Conditions
E. Institutional & Administrative Conditions

Figure 5 Classification of the Value Chain Knowledge Transfer Needs

The complete list of KT needs as developed in Deliverable 3.1 is given in Table 1 below.

KT Need		***Description***
A1	Exposing Craftsmen to Innovation	*Traditional craftsmen need to have more exposure to retrofitting innovations.*
A2	End User Take-Up of Research Results	*The end users need to have a better capacity and motivation to take up the results of the research organisations and use these results in their buildings.*
A3	Business Society Access to Knowledge Stock	*The retrofitting business society needs to have a greater ability in knowing how to access the knowledge stock.*
A4	Managing Intellectual Property	*The business society needs to be aware of tools to manage intellectual property.*
A5	Training Architects & Engineers in Retrofitting Technology	*The construction industry professionals (including architects, civil engineers, building services engineers, project managers, building designers, etc) need increased training and exposure to retrofit technologies.*
B1	Building Consortia & Energy Efficiency Networks	*Need to have a network organisation that will organise contacts with companies, knowledge transfer from innovation groups and guidance of building teams in order to implement innovation into daily building practice.*
B2	Intra-Academy Interaction	*Research institutions have staffs that actively pursue links with industry, but need to increase interaction amongst them.*
B3	Clustering of Retrofit Market Solutions	*Need to cluster innovative solutions to address practical problems with integrated solutions*
B4	Connecting Commercial Advice to EPBD Activity	*Increased connection between technical commercial advice and the energy performance and requirements of the actual buildings.*
C1	Applicability to the End User	*Scientists need to have increased contact with the end-users in order to understand the applicability of their research.*
C2	Real-Life Evaluation of Research Results	*Scientists need to evaluate the results of their research through actual implementation of the technology in real-life situations and not only in the laboratory.*
C3	Working in Response to Market Trends	*The scientific society needs to be in increased contact with the end users in order to be able to divert their activity rapidly in response to changes in the market.*
D1	Public R&D Initiatives & Innovation Funding	*The need to increase business motivation through the availability of public R&D initiatives and innovation funding.*
D2	Support Industry in R&D Take-Up	*Need for financial support for the industry to take up results of scientific innovation.*
D3	Support Occupant in Retrofit Take-Up	*Need for financial support for the occupants to be in a better position to invest in retrofitting technology.*
E1	Guidelines for R&D to Address End-User Knowledge Needs	*The need for increased European Commission guidelines for the research organisations that address the needs of the end-users in terms of the knowledge that is required for uptake of the retrofitting technologies.*
E2	Criteria for R&D Project Evaluation	*The need for evaluating publicly funded research projects via it's applicability to the end-user.*

Table 2 Knowledge Transfer Needs

Furthermore, these identified needs were also inserted into the questionnaire that was distributed to the value chain members in order for them to classify the importance of each need and its relevance as per their individual experience on working within the retrofitting value chain. The table below displays the knowledge transfer need as classified from the most to the least important as identified by the value chain agents.

	KNOWLEDGE TRANSFER NEED	TOTAL ASSESSMENT
A5	Training of construction professionals (including architects, civil engineers, building services engineers, project managers, building designers, etc) in retrofit technologies.	9,43
D3	Occupants need financial support to invest in EE retrofitting technology.	9,29
A1	Training of traditional craftsmen on EE retrofitting innovations.	9,10
D1	Increase business motivation through public R&D initiatives and innovation funding.	9,04
D2	Industry needs financial support to take up results of scientific innovation.	8,93
C4	When communicating research results, more focus needs to be given to practical benefits of the retrofit technology.	8,81
C2	Real-life evaluation of research results.	8,22
E2	Evaluation of publicly funded research projects via it's applicability to the end-user.	8,09
C1	Scientists need to have increased contact with the end-users in order to understand the applicability of their research.	7,74
A3	Training the business society to access the knowledge stock.	7,71
B1	Establishing network organisations that will coordinate knowledge transfer from innovation groups and assist in implementing innovation into daily building practice.	7,57
C3	R&D to divert their activity rapidly in response to changes in the market.	7,52
E1	EC guidelines for knowledge dissemination from the research institutions.	7,35
B2	Increased interaction amongst research institutions.	7,26
A4	The business society needs to be aware of tools to manage intellectual property.	7,10
B3	Clustering within the retrofit market to provide integrated solutions.	6,22
A2	Exposing the end users to the technological results of the research organizations.	5,97
B4	Connecting technical commercial advice to EPBD - energy performance and requirements of the actual buildings.	5,57

Table 3 Classification of the Knowledge Transfer Needs

Identification of the Knowledge Management Tools that are best suited to convey knowledge through the value chain have been studied and defined in Work Package 4. WP4 identified knowledge management and training tools that are suggested as the best options for impacting positively on the rate of knowledge transfer through the value chain. The analysis carried out aims to become a valuable guide and good practice basis to any organization or agent that intends to develop training material that is engaging, interesting and attractive for a specific target group according to their needs and expectations, while at the same time valorising the new information and communication technologies (ICT) available on the world wide web to be used for education and informational activities.

In addition, consideration is made towards the key competencies – knowledge, skills and attitudes- that are necessary for personal fulfilment, development, social inclusion, active citizenship and employment, so as to assist the selection of the proper mechanisms and thus incorporating them into the final output of the project.

The matrix below summarises the 3 "most selected" ICT training tools for each value chain agent, and an additional one ranking distinguishing "most selected" ICT training tools from the information receivers' and information providers' point of view. The results shown in this matrix are also the basis of the functioning of the Knowledge Transfer Framework itself, such as the favourite tools per agent, per agent as receiver/ provider, etc..

Ranking Results per Agent

Ranking Results (Receiver/ Provider)

	MOST VOTED TOOLS PER NEED		1º	2º	3º	1º	2º	3º
Public Bodies & Finance	**Financial Agents**	*R*	Podcasts (audio lectures)	Blog-based learning, social networking sites, community portals	Online forums	Podcasts (audio lectures)	Blog-based learning, social networking sites, community portals	Online forums
		P				Podcasts (audio lectures)	Simulation	Educational Games
	Public Admin.	*R*	Blog-based learning, social networking sites, community portals	Podcasts (audio lectures)	Webinars, web meetings, online conferences	Webinars, web meetings, online conferences	Blog-based learning, social networking sites, community portals	Online forums
		P				Blog-based learning, social networking sites, community portals	Podcasts (audio lectures)	Communication Tools
	GOV	*R*	Podcasts (audio lectures)	Blog-based learning, social networking sites, community portals	Online forums	Podcasts (audio lectures)	Blog-based learning, social networking sites, community portals	Online forums
		P				Podcasts (audio lectures)	Simulation	Educational Games
	Standarization	*R*	Blog-based learning, social networking sites, community portals	Podcasts (audio lectures)	Webinars, web meetings, online conferences	Webinars, web meetings, online conferences	Blog-based learning, social networking sites, community portals	Online forums
		P				Blog-based learning, social networking sites, community portals	Podcasts (audio lectures)	Communication Tools

Knowledge & Products Providers	**Software Developers**	*R* *P*	Online forums	e-learning courses"(synchronous, asynchronous)	Communication Tools	Online forums Webinars, web meetings, online conferences	e-learning courses"(synchronous, asynchronous) e-learning courses"(synchronous, asynchronous)	Communication Tools Communication Tools
	Technical Solutions	*R* *P*	Online forums	e-learning courses"(synchronous, asynchronous)	Communication Tools	Online forums Webinars, web meetings, online conferences	e-learning courses"(synchronous, asynchronous) e-learning courses"(synchronous, asynchronous)	Communication Tools Communication Tools
	Manufacturers	*R* *P*	Webinars, web meetings, online conferences	Communication Tools	Online forums	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Communication Tools Online forums	Video in learning courses Communication Tools
	Installers	*R* *P*	e-book	Webinars, web meetings, online conferences	Video in learning courses	e-book Online forums	Video in learning courses Webinars, web meetings, online conferences	Webinars, web meetings, online conferences Podcasts (audio lectures)
	R&D	*R* *P*	Communication Tools	Simulation	e-learning courses"(synchronous, asynchronous)	e-learning courses"(synchronous, asynchronous) Simulation	Communication Tools Communication Tools	Wiki tools Online forums
	Climate	*R* *P*	Communication Tools	Simulation	e-learning courses"(synchronous, asynchronous)	e-learning courses"(synchronous, asynchronous) Simulation	Communication Tools Communication Tools	Wiki tools Online forums
Energy Providers	**Renewable Energy**	*R*	Webinars, web meetings, online	Blog-based learning, social networking sites, community portals	e-learning courses"(synchronous, asynchronous)	Webinars, web meetings, online conferences	Blog-based learning, social networking sites, community portals	e-learning courses"(synchronous, asynchronous)

		P	conferences			Webinars, web meetings, online conferences	Communication Tools	Podcasts (audio lectures)
	Energy Dsitributors	R P	Webinars, web meetings, online conferences	Blog-based learning, social networking sites, community portals	e-learning courses"(synchronous, asynchronous)	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Blog-based learning, social networking sites, community portals Communication Tools	e-learning courses"(synchronous, asynchronous) Podcasts (audio lectures)
	Grid Operators	R P	Webinars, web meetings, online conferences	Blog-based learning, social networking sites, community portals	e-learning courses"(synchronous, asynchronous)	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Blog-based learning, social networking sites, community portals Communication Tools	e-learning courses"(synchronous, asynchronous) Podcasts (audio lectures)
Energy & Retrofitting Services	**ESCO**	R P	Webinars, web meetings, online conferences	Communication Tools	Simulation	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Communication Tools Simulation	Simulation e-book
	Architect. & Engineer.	R P	Webinars, web meetings, online conferences	Simulation	Video in learning courses	Webinars, web meetings, online conferences Simulation	Simulation Video in learning courses	Video in learning courses Online forums
	Audit Firms	R P	Webinars, web meetings, online conferences	Communication Tools	Simulation	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Communication Tools Simulation	Simulation e-book
ty assur	**Patent Offices**	R	Online forums	Webinars, web meetings, online	Communication Tools	Webinars, web meetings, online	Online forums	Mobile learning (mlearning)

		P		conferences		conferences e-learning courses"(synchronous, asynchronous)	Mind mapping	Blog-based learning, social networking sites, community portals
	Life Cycle Assessment	*R* *P*	Online forums	Webinars, web meetings, online conferences	Communication Tools	Webinars, web meetings, online conferences e-learning courses"(synchronous, asynchronous)	Online forums Mind mapping	Mobile learning (mlearning) Communication Tools
	Certificate entities	*R* *P*	Online forums	Webinars, web meetings, online conferences	Communication Tools	Webinars, web meetings, online conferences Online forums	Online forums e-book	Mobile learning (mlearning) Communication Tools
Demand	**Building Managers**	*R* *P*	Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences	Online forums	Blog-based learning, social networking sites, community portals Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Online forums Online forums
	Occupants	*R* *P*	Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences	Online forums	Blog-based learning, social networking sites, community portals Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Online forums Online forums

		MOST VOTED TOOLS PER NEED		Ranking Results per Need 1º	2º	3º	Ranking Results (Receiver/ Provider) 1º	2º	3º
Task 4.2	E1	EC guidelines for knowledge dissemination from the research institutions.	R	Communication Tools	Webinars, web meetings, online conferences	e-book	Communication Tools	Webinars, web meetings, online conferences	e-learning courses (synchronous, asynchronous)
			P				Communication Tools	Webinars, web meetings, online conferences	e-book
	A2	Exposing the end users to the technological results of the research organizations.	R	Webinars, web meetings, online conferences	Simulation	Blog-based learning, social networking sites, community portals	Communication Tools	Webinars, web meetings, online conferences	Blog-based learning, social networking sites, community portals
			P				Simulation	Augmented Reality applications & software, Virtual Reality worlds	Webinars, web meetings, online conferences
	B4	Connecting technical commercial advice to EPBD - energy performance and requirements of the actual buildings.	R	Webinars, web meetings, online conferences	Online forums	Podcasts (audio lectures)	Podcasts (audio lectures)	Online forums	Mind mapping
			P				Webinars, web meetings, online conferences	Online forums	Blog-based learning, social networking sites, community portals
Task 4.3	D	Occupants need financi	R	Communication Tools	Webinars, web meeti	Video in learning courses	Communication Tools	Webinars, web meetings, onlin	Video in learning courses

	3	al support to invest in E E retrofitting technology.	*P*		ngs, online conferences		Podcasts (audio lectures)	e conferences Communication Tools	Wiki tools
	D 2	Industry needs financial support to take up results of scientific innovation.	*R* *P*	Webinars, web meetings, online conferences	Communication Tools	Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences Communication Tools	Blog-based learning, social networking sites, community portals Online forums	Communication Tools Webinars, web meetings, online conferences
	A 4	The business society needs to be aware of tools to manage intellectual property.	*R* *P*	Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences	Mobile learning (mlearning)	Blog-based learning, social networking sites, community portals Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Mobile learning (mlearning)
Task 4.4	A 5	Training of construction professionals (including architects, civil engineers, building services engineers, project managers, building designers, etc) in retrofit technologies.	*R* *P*	Webinars, web meetings, online conferences	Simulation	e-learning courses (synchronous, asynchronous)	Webinars, web meetings, online conferences Simulation	Simulation Webinars, web meetings, online conferences	e-learning courses (synchronous, asynchronous) Educational Games
	D 1	Increase business motivation through public R	*R*	Webinars, web meetings, online confer	Communication Tools	Video in learning courses	Webinars, web meetings, online conferences	Communication Tools	Video in learning courses

		&D initiatives and innovation funding.	P	ences			Webinars, web meetings, online conferences	Communication Tools	Augmented Reality applications & software, Virtual Reality worlds
	E2	Evaluation of publicly funded research projects via it's applicability to the end-user.	R P	Blog-based learning, social networking sites, community portals	Online forums	Simulation	Online forums Simulation	Blog-based learning, social networking sites, community portals Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences Podcasts (audio lectures)
	A3	Training the business society to access the knowledge stock.	R P	Webinars, web meetings, online conferences	Educational Games	Video in learning courses	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Video in learning courses Educational Games	Educational Games e-learning courses (synchronous, asynchronous)
	B1	Establishing network organisations that will coordinate knowledge transfer from innovation groups and assist in implementing innovation into daily building practice.	R P	Online forums	Webinars, web meetings, online conferences	Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences Online forums	Online forums Blog-based learning, social networking sites, community portals	Blog-based learning, social networking sites, community portals Wiki tools

	C 3	R&D to divert their activity rapidly in response to changes in the market.	*R* *P*	Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences	Video in learning courses	Blog-based learning, social networking sites, community portals Blog-based learning, social networking sites, community portals	Webinars, web meetings, online conferences Webinars, web meetings, online conferences	Video in learning courses Online forums
	B 2	Increased interaction amongst research institutions.	*R* *P*	Online forums	Communication Tools	Webinars, web meetings, online conferences	Webinars, web meetings, online conferences Communication Tools	Online forums Online forums	e-learning courses (synchronous, asynchronous) Blog-based learning, social networking sites, community portals
	B 3	Clustering within the retrofit market to provide integrated solutions.	*R* *P*	Video in learning courses	Webinars, web meetings, online conferences	Online forums	Webinars, web meetings, online conferences Video in learning courses	Blog-based learning, social networking sites, community portals Webinars, web meetings, online conferences	Video in learning courses Online forums
Task 4.5	A 1	Training of traditional craftsmen on EE retrofitting innovations.	*R* *P*	Simulation	Video in learning courses	e-book	Simulation Simulation	Video in learning courses Educational Games	Webinars, web meetings, online conferences Video in learning courses

	C 4	When communicating r esearch results, more f ocus needs to be given to practical benefits of the retrofit technology.	*R* *P*	Online forum s	e-learning courses (s ynchronou s, asynchr onous)	Blog-based l earning, soci al networking sites, commu nity portals	Online forums Online forums	Blog-based lea rning, social ne tworking sites, community por tals e-learning cou rses (synchron ous, asynchron ous)	Video in learni ng courses e-book
	C 2	Real-life evaluation of r esearch results.	*R* *P*	Communicat ion Tools	Blog-base d learning, social net working sit es, commu nity portals	Webinars, w eb meetings, online confer ences	Communication Tools Communication Tools	Blog-based lea rning, social ne tworking sites, community por tals Blog-based lea rning, social ne tworking sites, community por tals	Online forums Webinars, web meetings, onlin e conferences
	C 1	Scientists need to have increased contact with the end-users in order to understand the appl icability of their resear ch.	*R* *P*	Webinars, w eb meetings, online confer ences	Online foru ms	Communicati on Tools	Communication Tools Blog-based lear ning, social net working sites, c ommunity portal s	Online forums Webinars, web meetings, onlin e conferences	Blog-based lea rning, social ne tworking sites, community port als Online forums

Table 4 Mapping between Needs, Agents and Tools

2.3. The Approach used for the Practical Procedures, Guidelines and Recommendations: The Business Model Canvas Approach

There are many different approaches to business model development and each one of them has its strengths and weaknesses. WP6 deliverables are based on the Business Canvas Framework which is widely supported around the world and has become the standard in many industries. The Business Model Canvas was initially proposed by Alexander Osterwalder[4], based on his earlier work on Business Model Ontology[5]. The framework has been built by a collaborative effort of hundreds of industry practitioners and there is already an industry working with tools and concepts around this framework.

The basic requirement for a Business Model Canvas is to be able to respond to a basic question: what is your business model and how will you earn money? According to Osterwalder & Pigneur[6], a business model describes the rationale of how an organization creates, delivers, and captures value. The process of business model construction is part of the overall business strategy. The Business Model Canvas is nowadays one of the most used frameworks for describing the elements of a business model. A business model is the description of the overall environment of an organization and is defined by several aspects, which answer the questions of how an organization creates, delivers, and captures value in economic, social, cultural or other contexts. The main business model functions are: articulating the value proposition; identifying market segments; defining the value chain and the firm's position; formulating the competitive strategy as well as addressing broader social and environmental aspects.

The Business Model Canvas in the framework of WP6 of ee-WiSE is used as a methodological approach rather than a technical approach. It provides a way of thinking and a mind-set that each deliverable of the specific work packages follows. It is a theoretical framework upon which the analysis will rely on the categories and questions that have to be answered in order to elaborate the four different deliverables. Each deliverable is developed based on the same information but from a different point of view. The Business Model Canvas is displayed in Figure 6 below.

[4] http://alexosterwalder.com/

[5] Alexander Osterwalder (2004). The Business Model Ontology - A Proposition In A Design Science Approach. PhD thesis University of Lausanne

[6] http://www.zebramc.com/introduction-to-the-business-model-canvas/

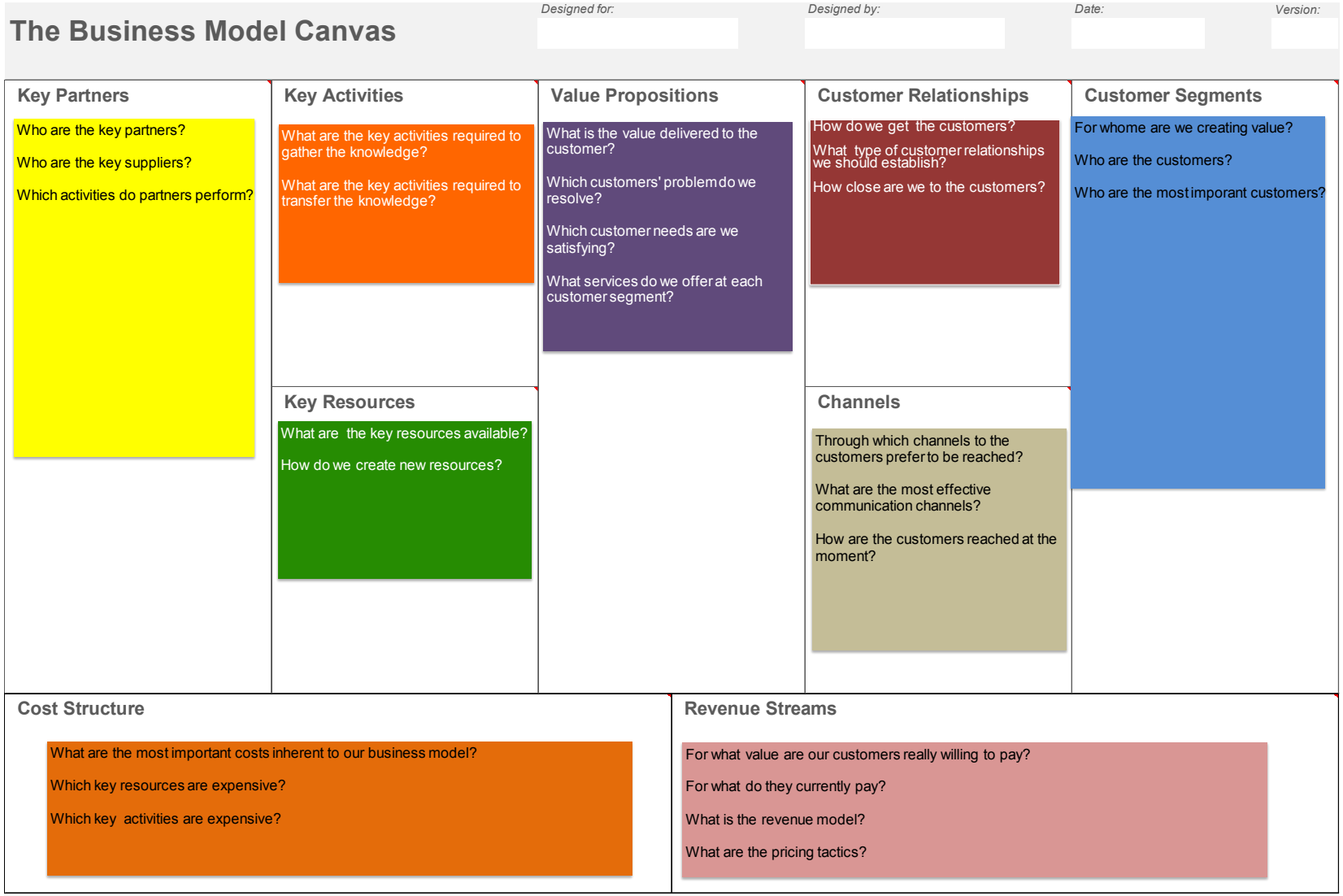

Figure 6 Analysis of the Business Model Canvas blocks

The Business Model Canvas components are:

Infrastructure

- **Key Activities.** This includes those steps that a value chain agent should take in order to be able to transfer knowledge in an added value approach, commonly known as the entity's value proposition.
- **Key Resources.** The Key Resources are those that are needed in order for the value chain agent indeed to create value for another agent and thus entice the flow of knowledge through the value chain. The Key Resources are also described as assets that are required in order to sustain and support the knowledge transfer. These resources could vary and could include the key staff involved, intellectual knowledge generated, physical infrastructure, etc.
- **Partner Network.** The partner network, or value chain agents as referred to within ee-WiSE, is the network of potential stakeholders who through collaboration can help in optimizing the operations and reduce risks of the knowledge transfer activity. For example if an agent wants to provide state of the art knowledge and hasn't got strong ties with universities that are usually the creators of state of the art knowledge, then the business model in any case couldn't be sustained for a long period of time since the knowledge offered will soon be out-dated.

Offering

- **Value Proposition.** This is defined as the knowledge base that the value chain agent s will offer to meet the needs of the knowledge receivers. According to Osterwalder, (2004), *a company's value proposition is what distinguishes itself from its competitors. The value proposition provides value through various elements such as newness, performance, customization, "getting the job done", design, brand/status, price, cost reduction, risk reduction, accessibility, and convenience/usability. The value propositions may be:*
    - Quantitative- price and efficiency
    - Qualitative- overall customer experience and outcome

Customers

- **Customer Segments.** A knowledge provider has to be able to categorize its different target groups and find ways that they could be served better. Usually in order to better sustain a knowledge transfer process for a long period of time, the needs of the various sets of knowledge receivers have to be satisfied a) in response to their different needs and b) their role in the value chain, e.g. the needs for policy makers are different to the needs of builders, so it is important to ensure that the corporate strategy will be implemented appropriately and thus satisfy the various needs of the selected group of clients.
- **Channels.** A channel refers to the knowledge transfer methodologies through which the knowledge will be provided to reach the targeted customers. Effective channels will distribute the knowledge in ways that are fast, efficient and cost effective. A knowledge provider can reach the knowledge receiver either through its own channels or partner/collaborators channels or through a combination of both.
- **Customer Relationship.** Usually this is one of the most important parts of a business model. A knowledge provider should be able to have solid relationship with the knowledge receivers if they want to ensure the survival and success of their knowledge transfer process.

Business Model Steps

In order to be able use the business model approach, three steps need to be followed:

Step 1 – The idea

- Scope: Solve our Target customers' problem and satisfy their needs
- How:

a) Understand Target End User Needs
b) Define the Need it will cover and how it will succeed
c) Create a Specific Offering

- Unsatisfied End User need?
- Doing Business in a different way?
- A new product or service that the market hasn't seen yet, or that is offered with a different or better value proposition?

Step 2 - Deliverable Design – (The added Value Formula)

- Scope: Identify the Key Resources & Key Processes

a) Present the strengths and weaknesses
b) Identify the Key Resources
c) Identify the Key Processes

Step 3 – Practical procedures, recommendations and Guidelines Report

- Scope: The restructuring of the deliverable based on the value chain agents feedback in relation to their expertise

a) Business objects have to be defined optimally from an information point of view as well as from a behavioural point of view
b) Information units have to be arranged in logical clusters and a certain information element must exist only once
c) Business procedures must be broken down to their elementary components, duplicate components have to be eliminated and the remaining components have to be assigned to a single owner - normally a certain agent

2.4. Methodology for Deliverable 6.2: Recommendations and guidelines for knowledge transfer regarding promoting EE market up-taking development.

The definition for *market up-take* provided in section 1.3 defines the readiness of the building owners and building managers to respond to the retrofit technologies showcased to them as the factor that mostly influences the rate or extent to which EE Retrofit technologies are implemented in a country or region. This readiness to take-up or response rate from the end users, who are the consumers and target market for EE retrofit technologies, is dependent on a number of factors originating from all of the other value chain members. These factors interplay to create situations that will either enable or hinder the market up-take of EE Retrofit technologies. The aim of Deliverable 6.2 is to provide useful guidelines and recommendations that will enable the promotion, education and awareness of EE retrofit solutions in order to change the consumers' mind set towards more energy efficient housing solutions and encourage the implementation of EE retrofit solutions in the building stock. The recommendations and guidelines serve to identify the best ways to bring the EE Retrofit technologies and relevant knowledge to the market via strategic communication and methods to effectively increase knowledge transfer flows between the value chain agents.

Within the guidelines and recommendation section of this deliverable, the knowledge transfer needs have been categorised into a three-fold approach: Knowledge Generation, Knowledge Sharing and Knowledge Dissemination. The definition of the three-fold approach is detailed in section 3.

The guidelines and recommendations described in this deliverable are a result of the research that has been carried out in the previous ee-WiSE work packages together with sourcing of existing best practices that could lead to the implementation of a higher level of awareness and better enable the knowledge transfer through the EE retrofitting value chain with the aim of increasing the market up-take rate within the sector.

3. THE THREE FOLD APPROACH

3.1. Categorization of the Knowledge Transfer Needs

In order to achieve the Knowledge Transfer global strategy these WP6 closing deliverables have been organized, considering the 3 main aspects of *Knowledge Transfer* when focusing on the KT Needs. *Knowledge Transfer* involves not only good knowledge sharing, but generating new knowledge in a comprehensive way and effective knowledge dissemination as well. Thus, the 3 pillars of the Knowledge Transfer global strategy: Knowledge Generation, Knowledge Sharing and Knowledge Dissemination are used to categorize the sector's needs and cater for the threefold approach in a holistic way. Figure 8 below shows the classification of the needs in their 5 needs categories and the 3 Knowledge Transfer categories.

Knowledge Generation	
A1	Exposing Craftsmen to innovation
A3	Business Society Access to Knowledge Stock
A5	Training Architects & Engineers in Retrofitting Technology
B2	Intra-Academic Interaction
C3	Working in Response to Market Trends
D1	Public R&D Initiatives & Innovation Funding
E2	Criteria for R&D Project Evaluation

Knowledge Sharing	
C1	Applicability to the End User
C2	Real-Life Evaluation of Research Results
C4	Results Focusing on Practical Benefits

Knowledge Dissemination	
A2	End user Take Up of Research Results
A4	Managing Intellectual Property
B1	Building Consortia & Energy Efficiency Networks
B3	Clustering of Retrofit Market Solutions
B4	Connecting Commercial Advice to EPBD Activity
D2	Support Industry in R&D Take-Up
D3	Support Occupant in Retrofit Take-Up
E1	Guidelines for R&D to Address End-User Knowledge Needs

A. SKILLS & AWARENESS
B. KNOWLEDGE MANAGEMENT
C. R&D APPROACH
D. FINANCIAL
E. INSTITUTIONAL & ADMINISTRATIVE

Figure 7 Knowledge Transfer Needs within the three fold approach

3.2. Needs per categories

The table below shows how the needs have been associated within each one of the deliverables' topics. Each deliverable contains recommendations on the specific topics that are provided to assist in satisfying the knowledge transfer needs associated to the topic in a comprehensive manner, using the Knowledge Transfer threefold approach background

		Knowledge Transfer Needs within the three fold approach	Deliverables			
			D6.1	D6.2	D6.3	D6.4
Knowledge Generation	A1	Exposing Craftsmen to innovation	1	1	1	
	A3	Business Society Access to Knowledge Stock	1	1		
	A5	Training Architects & Engineers in Retrofitting Technology	1	1	1	1
	B2	Intra-Academic Interaction			1	1
	C3	Working in Response to Market Trends	1	1		
	D1	Public R&D Initiatives & Innovation Funding	1			1
	E2	Criteria for R&D Project Evaluation	1	1		1
Knowledge Sharing	C1	Applicability to the End User	1	1	1	
	C2	Real-Life Evaluation of Research Results	1	1		1
	C4	Results Focusing on Practical Benefits		1	1	
Knowledge Dissemination	A2	End user Take Up of Research Results	1	1	1	
	A4	Managing Intellectual Property	1	1		1
	B1	Building Consortia & Energy Efficiency Networks		1	1	1
	B3	Clustering of Retrofit Market Solutions		1	1	
	B4	Connecting Commercial Advice to EPBD Activity	1	1	1	1
	D2	Support Industry in R&D Take-Up	1	1		1
	D3	Support Occupant in Retrofit Take-Up	1	1		1
	E1	Guidelines for R&D to Address End-User Knowledge Needs		1	1	
		Needs Per Deliverable	13	16	10	10

Table 5 Knowledge Transfer Needs assigned to each WP6 Deliverable

With particular focus to Deliverable D6.2, sixteen knowledge transfer needs out of a total of eighteen have been selected as containing components affecting market up-take and shall be described in this document. The sixteen knowledge transfer needs have been split into the 3-fold approach as shown in 0Table 6.

Knowledge Generation		Knowledge Sharing		Knowledge Dissemination	
A1	Exposing craftsmen to innovation	C1	Applicability to the end user	A2	End user take up of research results.
A3	Business society access to knowledge stock.	C2	Real-life evaluation of research results.	A4	Managing intellectual property.
A5	Training architects & engineers in retrofit technologies.	C4	Results focusing on practical benefits	B1	Building consortia & energy Efficiency networks
C3	Working in response to market trends			B3	Clustering of retrofit market solutions.
E2	Criteria for R&D project evaluation			B4	Connecting technical commercial advice to EPBD activity
				D2	Support industry in R&D take up
				D3	Support occupant in EE retrofitting take up.
				E1	EC guidelines for R&D to address end-user knowledge needs

Table 6 Market up-take knowledge transfer needs split into the 3-fold approach

Guidelines and recommendations for each of the knowledge transfer needs as they have been split into the three-fold approach are detailed in Chapter 4 where methods to meet the knowledge transfer needs are explored and tackled within the knowledge generation, knowledge sharing and knowledge dissemination points of view.

3.3. Analysis of Knowledge Transfer Needs Related to Knowledge Generation

Knowledge generation is defined as the development of research outputs or research syntheses that allows for the formation of new ideas through interactions between explicit and tacit knowledge in human minds.[7] The ability to generate new knowledge is crucial to the success of an industry and to improving the effectiveness of technology.

[7] Business Directory: definition for knowledge creation

Knowledge generation according to Nonaka's SECI Model (2001)[8] is about continuous transfer, combination, and conversion of the two different types of knowledge (Frost 2014)[9], namely:

- Explicit knowledge

  Knowledge that is formalised and codified and is stored in documents, databases, etc. This knowledge is fairly easy to identify, store and retrieve.

- Tacit knowledge

  This is intuitive knowledge and know-how that is rooted in experience and practice. Although this knowledge is hard to communicate, it is regarded as the most valuable source of knowledge and the most likely to lead to breakthroughs in technology.

Within the SECI Model, Nonaka describes four modes of knowledge generation:

a. **Socialization** - This dimension relates to social interaction (tacit to tacit knowledge transfer), sharing knowledge through face-to-face encounters or through experiences. For example, meetings and brainstorm sessions form part of this mode of interaction.
b. **Externalization** - Publishing knowledge that is tacit in nature into a form that makes it explicit allowing it to be shared with others, thus becoming the basis for generation of new knowledge. For example, concepts, images and written documents used in new product development.
c. **Combination** - This dimension relates to the usage of existing explicit knowledge banks that are organised, edited and processed to create new explicit knowledge. For example, the building of prototypes.
d. **Internalization** - The process of internalisation refers to learning by doing thus converting explicit knowledge into tacit knowledge. It is a process of continuous individual and collective knowledge generation that gives the added ability to see connections and recognise patterns thus creating the possibility for new ideas and concepts.

Also, Cook and Brown (1999)[10] distinguish between explicit and tacit knowledge, and suggest that knowledge generation is a product of the interplay between them. The shift in condition between the possession of knowledge and the act of knowing - something that comes about through practice, action, and interaction- is the driving force in the generation of new knowledge. Furthermore, in order for this interplay to be most fruitful, it is important to support unstructured work environments in areas where creativity and innovation are important.

One might say that knowledge generation relies on knowledge sharing combined with the ability to put knowledge into practice in an environment which supports interaction and experimentation. Knowledge is generated through practice, collaboration, interaction, and education, as the different knowledge types are shared and converted. Beyond this, knowledge generation is also supported by relevant information and data which can improve decisions and serve as building blocks in the generation of new knowledge.

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[8] Nonaka, I., Toyama, R., Byosiere, Ph. (2001) "A theory of organizational knowledge creation: understanding the dynamic process of creating knowledge", in: Dierkes, M., Antal, A.B., Child, J., Nonaka, I. (eds.) Handbook of organizational learning and knowledge, pp.487-491, Oxford University Press, Oxford.
[9] Frost, Alan (2014). A Synthesis of Knowledge Management Failure Factors. http://www.knowledge-management-tools.net/A%20Synthesis%20of%20Knowledge%20Management%20Failure%20Factors.pdf
[10] Cook, S.D.N. and J.S. Brown (1999) Bridging Epistemologies: The Generative Dance between Organizational K nowledge and Organizational Knowing. In: Organization Science 10 (4), pp.381-400.

According to the methodological framework described earlier and the Business Model Canvas approach, ee-WiSE consortium members had used the Business Model Canvas components in order to categorize the information collected from all the previous work packages of the project. The categorization is based on the needs as they had been distributed in WP3.

<table>
<tr><th colspan="3">A1. Exposing Craftsmen to innovation</th></tr>
<tr><td>Key partners</td><td colspan="2">1.Knowledge and Products Providers
- Technical Solutions Developer
- Software Developer
- Manufacturer
- R&D
2.Energy and Retrofitting Services Providers
- Architect & Engineer
3.Energy Providers
- Renewable Energy</td></tr>
<tr><td>Key activities</td><td colspan="2">Expose the traditional craftsmen to demonstration projects.
Tools for the home-owner and traditional craftsmen for the decision making</td></tr>
<tr><td>Key resources</td><td colspan="2">- Material related to Experimental Building Projects, thus the exploitation of buildings and tools to disseminate results is necessary.
- Creating a connection of Experimental Building Projects to training programmes for traditional craftsmen.
- Creating a connection of Experimental Building Projects to knowledge providers to expose their technology.</td></tr>
<tr><td rowspan="2">Value Proposition</td><td>Tools

KTF Tool (ee-wise.eu)</td><td>Networks
http://www.proyectoedea.com/en/
http://e4rsim2.aidico.es/
http://www.arfrisol.es/ARFRISOLportal/
http://www.youtube.com/user/Trainenergy/videos
http://www.u4energy.eu/web/guest/33</td></tr>
<tr><td>Tips for Effective Knowledge transfer
- Keep always a visual and simple explanation of how the EE system works and is installed.
- Notice that simulation tools are the favourite choice for this Knowledge, so software developers need to get involved.
- Use videos apart from the e-material to disseminate EE building components and systems if you are a solutions designer.
- Experimental building projects have a lot of useful demonstration material for EE training.
- If you are related to an experimental building, allow visitors for a living demonstration in order to produce impulse the training experience and assist connecting EE directly to the market.
- Keep the experimental building updated by collaborating with solutions designers to test their EE measures.</td><td>Best Practices
- http://www.proyectoedea.com/en/
Research project that developed 2 Experimental buildings to obtain comparative real-time data from passive/active systems simulated and tested. Visitors are welcomed!
- http://e4rsim2.aidico.es/
Simulation Tool developed throughout E4R Project which is capable of providing an estimated energy efficiency evaluation of your building online.
- http://www.arfrisol.es/ARFRISOLportal/
PSE-ARFRISOL is a project that aims for the adequacy of bioclimatic architecture and solar energy in symbolic public buildings. The simulation of the buildings can be checked online.
- http://www.youtube.com/user/Trainenergy/videos
Train energy YouTube channel that provides videos explaining hoe EE measures work and are installed in real life. (German - English)
- http://www.u4energy.eu/web/guest/33
The U4energy website offers resources to help teachers, students and school management introduce energy efficiency in the classroom and replicate proven success stories!</td></tr>
</table>

Customer Relationship	Active Relationship (Personal Contact) Automated Systems (Newsletter, Simulation, Video in learning courses, e-book)
Channels	Brochures with simple explanations, e-material, simulation tools and videos, which contain demonstration of EE measures.
Customer Segments	**1.Knowledge and Products Providers** - Installer **2.Energy and Retrofitting Services Providers** - Architect & Engineer

A3. Business Society Access to Knowledge Stock		
Key partners	**1.Knowledge and Products Providers** - Technical Solutions Developer - Software Developer - Manufacturer **2.Energy and Retrofitting Services Providers** - ESCO	
Key activities	Training for staff and companies. Build an educational framework that will provide a qualification to the new generation of kno wledge transfer professionals.	
Key resources	Create an operation pattern to narrow the gap of knowledge sharing among groups.	
Value Proposition	**Tools** KTF Tool (www.ee-wise.eu)	**Networks** http://www2.schneider-electric.com/sites/corporate/en/products-services/training/energy-university/energy-university.page http://www.socialhousingaction.com
	Tips for Effective Knowledge transfer - Material should be clear and easy to be adopted by the members. - A visual explanation of how the EE system works and what is installed is necessary. - Educational Game tools are among the favourite choice for this knowledge transfer, so software developers need to get involved. - Solution designers have to use videos apart from the e-material to disseminate EE building components and systems. - Experimental building projects have a lot of useful demonstration material for EE training. - Actors involved in an experimental building, have to allow visitors for a living demonstration in order to maximise the impact of the training experience and assist in connecting EE directly to the market. - Experimental buildings have to be updated by collaborating with solutions designers to test their EE measures.	**Best Practices** Schneider Electric- Energy University is a free online, educational resource, offering vendor-neutral courses on energy efficiency topics to help the user identify, implement, and monitor efficiency improvements within an organization. Social Housing Action to Reduce Energy Consumption is an initiative consisting of forums that were set up for each of the 8 countries involved; training sessions took place, involving 1000 participants, mainly residents, but also energy experts, building managers, housing funds, local authorities, teachers and architecture students.
Customer Relationship	Webinars, web meetings, online conferences Long-term strong relationship (personal and automated) Databanks	
Channels	- Educational Material, - Simulation Solutions, - Videos, - Leaflets with instructions,	

	- Brochures with simple drawings
Customer Segments	**1. Public Bodies & Finance** - Public Administration **2. Knowledge and Products Providers** - Installer **3. Energy and Retrofitting Services Providers** - Architect & Engineer

A5. Training Architects & Engineers in Retrofitting Technologies		
Key partners	**1.Public Bodies & Finance** - Public Administration - Government **2.Knowledge and Products Providers** - Technical Solutions Developer - R&D	
Key activities	- Implement higher level of education in retrofitting Technologies for construction professionals. - Increase or adopt Curriculum for Bachelor or Master Degrees.	
Key resources	- New courses at universities or revising curriculum for bachelor and master Degree to improve knowledge transfer for Architects and Engineers. Introduce Architects and Engineers to experimental buildings and demonstrative videos of new technologies.	
Value Proposition	**Tools** KTF Tool (ee-wise.eu)	**Networks** www2.schneider-electric.com/sites/corporate/en/products-services/training/energy-university/energy-university.page http://www.youtube.com/watch?v=chl5_z-gkWg
	Tips for Effective Knowledge transfer - Keep always a visual explanation of how the EE system works and is installed. - Notice that simulation tools are the favourite choice for this Knowledge, so software developers need to get involved. - Use videos apart from the e-material to disseminate EE building components and systems if you are a solutions designer. - Experimental building projects have a lot of useful demonstration material for EE training. - If you are related to an experimental building, allow visitors for a living demonstration in order to produce impulse the training experience and assist connecting EE directly to the market. - Keep the experimental building updated by collaborating with solutions designers to test their EE measures. - Short-courses together with other informal learning events such as	**Best Practices** - Schneider Electric- Energy University- the Energy University is a free online educational resource, offering vendor-neutral courses on energy efficiency topics to help the user identify, implement, and monitor efficiency improvements within an organization. http://www2.schneider-electric.com/sites/corporate/en/products-services/training/energy-university/energy-university.page - Some more examples can be taken from the Project BUILD UP Skills Malta [http://www.buildupskillsmalta.com/]

	seminars and workshops would serve to provide further educational opportunities.	
Customer Relationship	Long-term deep relationship (Customer contact) Automated Systems (Newsletter, Webinars, Web Meetings, Online Conferences, Simulation) e-learning courses (synchronous, asynchronous)	
Channels	Videos, interactive presentations in dissemination events and experimental building visits.	
Customer Segments	**2.Energy and Retrofitting Services Providers** - Architect & Engineer	

B2. Intra-Academic Interaction		
Key partners	**1.Knowledge and Products Providers** - R&D	
Key activities	- Movement of academic staff between R&D institutions - Creation of knowledge banks, - Setting up of online forums, - Organization of brokerage events for creating collaborative joint research activities on specific retrofitting topics.	
Key resources	Guidelines for knowledge providers to disseminate and to make available to the rest of the academic and research community the outcomes of the research. The guidelines will be designed to be implemented in different type of activities such as: videos, podcasts, Forums, Webinars.	
Value Proposition	**Tools** KTF Tool (ee-wise.eu)	**Networks** www.proyectoedea.com/en/ www.enea.it http://www.youtube.com/watch?v=t5Dm6Dxn6B4
	Tips for Effective Knowledge transfer - Create a Database with all the already developed EE solutions - Create an open Calendar with all EE events which can be updated from all the involved agents - Keep always a visual explanation of how the EE system works and is installed. - Use videos apart from the e-material to disseminate EE building components and systems if you are a solutions designer. - Experimental building projects have a lot of useful demonstration material for EE training. - If you are related to an experimental building, allow visitors for a living demonstration in order to produce impulse the training experience and assist connecting EE directly to the market. - Keep the experimental building updated by collaborating with solutions designers to test their EE measures.	**Best Practices** EDEA, ENEA
Customer Relationship	Active Relationship (Personal Contact) (Seminars, academic meetings) Online Contact (Video In Learning Courses, Podcast (audio lectures), Webinars, Web Meetings, Online conferences)	
Channels	Videos, Presentations on the topic, Samples, Audio lectures.	

Customer Segments	**1.Public Bodies & Finance** - Public Administration - Government

C3. Working in Response to Market Trends		
Key partners	**1. Knowledge and Products Providers** - Technical Solutions Developer - R&D	
Key activities	Modifications and improvements to the innovation that are resulting from a change originating in response to market feedback Form academic-industry collaborations to improve the effectiveness of the innovation process.	
Key resources	Guidelines for knowledge providers to effectively transfer their technology and knowledge. These guidelines may take the form of: - videos in which the problems and solutions can be demonstrated, - Forums where the exchange of problems and solutions can be debated, - Webinars for the Academic Industry cooperation. - Tools to allow the R&D society to understand the needs of the traditional workforce and the end users.	
Value Proposition	**Tools** KTF Tool (ee-wise.eu)	**Networks** www.construction21.eu www.elih-med.eu/Layout/elih-med/
	Tips for Effective Knowledge transfer - Create a mechanism (forum) that will relay the R&D institutes with the market needs. - If you are involved in an experimental building, allow visitors for a living demonstration in order to maximise the training experience and assist in connecting EE directly to the market. - Keep the experimental building updated by collaborating with solutions designers to test their EE measures.	**Best Practices** - Construction21 Europe. The European platform for green building practitioners - ELIH-MED aims to test and identify feasible cost-effective technical solutions and innovative financial mechanisms. It does so through large scale pilot actions backed by the ERDF (European Regional Development Fund).
Customer Relationship	Close contact through online resources (such as social networking sites, etc.) Automated contact through (CRM, mail, newsletter, etc.) Personal Contact through support agents.	
Channels	Videos, community portals, Webinars, web meetings, online conferences Presentations on the topic, Samples, A platform on which to create blog-based learning.	
Customer Segments	**1.Public Bodies & Finance** - Public Administration - Government **2.Knowledge and Products Providers** - Installers **3.Energy and Retrofitting Services Providers** - Architect & Engineer **4.Demand** - Build Manager - Occupant	

<table>
<tr><th colspan="3">D1. Public R&D Initiatives & Innovation Funding</th></tr>
<tr><td>Key partners</td><td colspan="2">1. Knowledge products & services
- Software developers
- Manufacturers
- R&D
2. Energy Retrofitting sector
- Architects & Engineer
3. Energy Providers
- Renewable Energy</td></tr>
<tr><td>Key activities</td><td colspan="2">Master plans involving public and private actors in R&D activity.
Recommendations to have both EU wide and R&D plans that support R&D activities</td></tr>
<tr><td>Key resources</td><td colspan="2">Videos of economist that easily explain the existing financial tools,
Web tools forums,
Webinars</td></tr>
<tr><td rowspan="2">Value Proposition</td><td>Tools
KTF Tool (ee-wise.eu)</td><td>Networks
http://www.kickstarter.com/
www.marie-medstrategic.eu/en/success-stories-or-best-practices/best-practices.html</td></tr>
<tr><td>Tips for Effective Knowledge transfer
- Create publicly funded websites in which new ideas can be funded either by financial institutes or VCs.
- Create forums where new engineers will present new ideas and financial institutions will finance them.</td><td>Best Practices
MARIE PROJECT - development of model “solutions” regarding policy, funding mechanisms, products & services.</td></tr>
<tr><td>Customer Relationship</td><td colspan="2">Long-term strong relationship (personal and automated)
Automated systems (databanks)</td></tr>
<tr><td>Channels</td><td colspan="2">Leaflets.
Webinars, web meetings, online conferences.
Communication Tools.
Video in learning courses.
Basic start materials about bank products.</td></tr>
<tr><td>Customer Segments</td><td colspan="2">1. Knowledge products & services
- Installers
2. Demand
Occupants</td></tr>
</table>

<table>
<tr><th colspan="2">E2. Criteria for R&D Project Evaluation</th></tr>
<tr><td>Key partners</td><td>1. Knowledge products & services
- R&D</td></tr>
<tr><td>Key activities</td><td>- Involve the end users in the evaluation of research projects.
- Including project evaluation criteria that will rate the final result.</td></tr>
<tr><td>Key resources</td><td>Videos of economist that easily explain the existing financial tools,
Web tools Forums,
Webinars</td></tr>
</table>

Value Proposition	**Tools eg KTF Tool (ee-wise.eu)** KTF	**Networks** http://www.elih-med.eu/Layout/elih-med/ http://fund.corpbank.bg/ https://www.youtube.com/watch?v=sq_mndyvy6a
	Tips for Effective Knowledge transfer - Create an easily accessible FAQ Forum involving all actors of the EE Retrofitting value chain. - Use videos apart from the e-material to disseminate EE building components and systems if you are a solutions designer. - Present to the end user the needs of the new projects.	**Best Practices** - Programme for energy-efficient retrofitting of Bulgarian Households; - Energy Efficiency in Low Income Housing in the Mediterranean.
Customer Relationship	Automated Systems (Databanks) Active Relationship (Personal Contact) (customer feedback) Blog-based learning, community Online forums Simulation	
Channels	- Government - Simulation solutions, - social networking sites - Transparent information how to deal with the projects, how to search for the information in the database, - Platform for the forums	
Customer Segments	**1. Public Bodies & Finances** - Public Administration - Government **2. Demand** - Building Managers	

3.4. Analysis of Knowledge Transfer Needs Related to Knowledge Sharing

Szulanski (1996)[11] found that when the relationship between the source of knowledge and the recipient was distant or problematic, knowledge transfer was more difficult. The ability to identify and share knowledge is an important factor for market competitive advantage.

The three factors that Szulanski found to be the greatest impediments to knowledge sharing are: causal ambiguity of the knowledge itself, lack of absorptive capacity of the recipient, and an arduous relationship between the source and recipient. These impediments are all knowledge-related barriers. In contrast, conventional wisdom on why knowledge is hard to transfer within firms has focused almost exclusively on motivational barriers such as interdivisional jealousy, lack of incentives, lack of buy-in, resistance to change, lack of commitment, etc. The results of this study indicate that the difficulty firms have in transferring knowledge may be less because organizations do not want to learn and more because they do not know how to. Therefore, firms may want to consider devoting resources to develop the learning capacities of organizational units, fostering closer relationships between units, and systematically understanding and communicating practices.

[11] SZULANSKI, G. (1996): "Exploring Internal Stickiness: Impediments to the Transfer of Best Practice within the Fir m", Strategic Management Journal, Vol. 17 (Special Issue), pp. 27-43.

Using this principle, knowledge sharing within the ee-WiSE project refers to exposing of generated or existing knowledge to others in order to improve skills and ideas about energy efficiency retrofitting. In the framework of addressing the above idea that knowledge is not shared effectively because organisations do not know how to do that, ee-WiSE had developed knowledge transfer guidelines which are synopsized on the needs tables analysed based on the Business Model Canvas.

The analysis includes the methods for sharing the knowledge: requiring face-to-face contact, opportunities for experiential learning, communication channels, innovative methods, etc. In all instances, the study of the needs for knowledge sharing takes into account the various forms of sharing mechanisms that are best suited for interpretation and adaptation by the value chain agent who is receiving the information.

<table>
<tr><th colspan="3">C1. Applicability to the End User</th></tr>
<tr><td>Key partners</td><td colspan="2">1.Knowledge and Products Providers
- Installer
- Manufacturer
2.Public Bodies & Finance
- Pub. A
3.Demand
- Occupants</td></tr>
<tr><td>Key activities</td><td colspan="2">Increase interaction between scientists and the agents at the end of the value chain.
Create new communication channels between agents to improve EE solutions with their feedback</td></tr>
<tr><td>Key resources</td><td colspan="2">Improve communication skills in scientists and ensure recognition of communication efforts.</td></tr>
<tr><td rowspan="2">Value Proposition</td><td>Tools

KTF Tool (ee-wise.eu)</td><td>Networks
http://bookshop.europa.eu/en/energy-cbWmMKABstNjAAAAEjNZEY4e5L/</td></tr>
<tr><td>Tips for Effective Knowledge transfer
- Use simple questionnaires with scale question type.
- If you are an occupant, make sure the feedback provided is related to the analysed technology.
- If you are a Manufacturer or Installer, you can provide valuable feedback to scientists regarding the technology production and implementations processes.
- If you are a Public Admin, your feedback is important regarding the chances the EE technology has to success in society and to receive an investment incentive.
- Public Admin, need to moderate the communication channels and foster scientist to participate on them.
- Also, Public Admin can gather this feedback, and translate it into summarized guidelines for scientist to improve communication skills.</td><td>Best Practices
Online European bookshop where the research results are exposed in a friendly way.</td></tr>
<tr><td>Customer Relationship</td><td colspan="2">Automated Systems (questionnaires, customer feedback)
Online Contact (Webinars, web meetings, online conferences, Online Forums, Communication Tools)</td></tr>
<tr><td>Channels</td><td colspan="2">Online events, Forums or any communication tool where scientists and end-users are able to interact</td></tr>
</table>

Customer Segments	**1.Knowledge and Products Providers** - R&D - Technical Solutions Developer

C2. Real-life evaluation of research results		
Key partners	**1.Public Bodies & Finance** - Public Administration - Finance **2.Knowledge and Products Providers** - Technical Solutions Developer - R&D - Manufacturer **3.Quality *Assurance*** - Life Cycle Assessment - Certificate Body - Patent Office	
Key activities	Exposing the advances of the research activity to the end users through a stock of buildings that can be used for real-life testing.	
Key resources	Supply of real life cases to allow evaluation of research results: - Real-life experimental buildings: from experimental building projects. - Public buildings: belonging to the Public Administration. - Residential buildings: belonging to owners that have been encouraged through subsidies and reduced rates. Comparison of the scientific feedback obtained with the owners' impressions and presented to the scientific community and general society.	
Value Proposition	**Tools** KTF Tool (ee-wise.eu)	**Networks** http://enercitee.eu/Sub-Projects/RIEEB---Regional-Impact-with-Energy-Efficient-Buildings,57/ http://www.renov.proyectoedea.com/es/content/objetivos-0 www.esesh.eu www.construction21.eu www.cicstart.org www.elih-med.eu/Layout/elih-med/ www.iee-square.eu;www.eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=1738
	Tips for Effective Knowledge **transfer** - Public Admin bodies should develop a program to promote collaboration between house-owners and solutions designers, considering also support from financial agents. - Quality Assurance agents, provide assistance for certificates in the real-life testing approach. - Solutions designers are to develop easy understandable material that explains the EE system and its monitoring process. - Create methods to gather the users' experiences and translate them into technical input to improve the technology. - Experimental building projects and other	**Best Practices** - Practical guidelines and policy recommendations produced within EnercitEE will provide valuable assistance for European regions aiming to improve their energy performance and policies. - The eSESH project aims at helping Europe to meet emission targets by achieving a significant reduction of energy consumption in European social housing. - Construction21 Europe. The European platform for green building practitioners - CIC Start Online is a collaborative effort between universities for academic consultancy on sustainable building design and refurbishment. - ELIH-MED aims to test and identify feasible cost-effective technical solutions and

	existing buildings should be considered for real-life evaluation.	innovative financial mechanisms. It does so through large scale pilot actions backed by the ERDF (European Regional Development Fund). - The SQUARE project aims to assure energy efficient retrofitting of multifamily housing with good indoor environment, in a systematic and controlled way.
Customer Relationship	Active Relationship (Personal Contact) (meetings) Online Contact (Communication Tools, Blog-based learning, social networking sites, community portals, Webinars, web meetings, online conferences)	
Channels	Guidelines, community websites, and online events.	
Customer Segments	**1.Public Bodies & Finance** - Public Administration **2.Knowledge and Products Providers** - Technical Solutions Developer - R&D - Installer - Manufacturer **3.Energy and Retrofitting Services Providers** - Architect & Engineer **4.Quality Assurance** - Life Cycle Assessment - Certificate Body **5.Demand** - Occupant - Building Manager	

C4. Results Focusing on Practical Benefits		
Key partners	**1.Knowledge and Products Providers** - Technical Solutions Developer - R&D - Manufactures **2.Energy Providers** - Renewable Energy **3.Energy and Retrofitting Services Providers** - ESCO	
Key activities	- Readily available information from product and technology data sheets. - Knowledge sharing events (encouraged by admin) where the owners and supporting agents of the new retrofit technologies will have the opportunity to present the results of the new technology advances to the rest of the value chain.	
Key resources	- Experimental Building Projects that will allow the retrofit technologies providers to obtain the practical benefit input from the building testing and expose it. - Collection of energy performance data gathered from owners' impressions to be defined as an essential duty after a technology is installed, both in terms of economic savings and comfort. - ESCOs can conduct the exposition of owners' impressions on their own, while additionally they can follow a dual team approach presentation between the owner and the solution provider.	
Value Proposition	**Tools** KTF Tool (ee-wise.eu)	**Networks** http://www.ase.org/blog/top-10-energy-efficiency-smartphone-apps https://www.gov.uk/government/news/save-energy-cash-this-winter http://www.smarthome.com/forum/default.asp http://blog.togetherwesave.com/

		www.maimona.org www.elih-med.eu/Layout/elih-med/
	Tips for Effective Knowledge transfer - If you are a Public Admin, foster opinion exchange in community websites between end-users regarding benefits on EE R&D results experienced. End-users listen to other end-users! - Translate your energy or CO2 saving results, and include economical savings and comfort level information. - Include images with the information you provide. - Develop a "social" version of your information sheet avoiding technical language and including more interesting parameters for society.	**Best Practices** - Maimona Foundation aims to support the development of business plans and strategic plans in all project types. It assists in finding partners for projects as well as relevant information to move the project forward together with risk capital procurement and financial resources sourcing. - ELIH-MED aims to test and identify feasible cost-effective technical solutions and innovative financial mechanisms. It does so through large scale pilot actions backed by the ERDF (European Regional Development Fund).
Customer Relationship	Long-term relationship (Personal Contact) Online Contact (Customer feedback)	
Channels	Forums and community portals are the most familiar tools for end-users, but e-material is also welcomed Video In Learning Courses, Podcast (audio lectures), Webinars, Web Meetings, Online conferences	
Customer Segments	**1.Knowledge and Products Providers** - Installer **2.Energy and Retrofitting Services Providers** - Architect & Engineer **3.Demand** - Occupant - Building Manager	

3.5. Analysis of Knowledge Transfer Needs Related to Knowledge Dissemination

Knowledge dissemination is defined as the communication of research outputs to potential users with the expectation that the knowledge will be used conceptually (for learning, enlightenment, or the acquisitio n of new perspectives or attitudes) or instrumentally (in the form of modified or new practices). Knowled ge dissemination is a crucial part of knowledge management since it ensures that knowledge is made a vailable to those who need it.

The essential factors for effective dissemination that lead to eventual knowledge utilisation are:

- USER: establishing the appropriate target group
- MEDIUM: means via which information is to be disseminated
- CONTENT: knowledge base that is to be disseminated
- CONTEXT: presentation of the knowledge in the way that is most meaningful to the user
- SOURCE: the knowledge provider

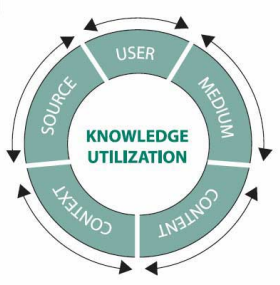


Figure 8 Knowledge utilisation as a result of knowledge dissemination

Effective dissemination depends on other factors including optimum budget allocation, society, culture, etc. Various analytical tools exist to gauge the effectiveness of the knowledge dissemination activity, e.g. questionnaires. A guide to creating an effective knowledge dissemination plan defines ten main essential elements[12]:

1. **Goals:** Determine and document the goals of your dissemination effort for your proposed project.
2. **Objectives**: Associate each goal with one or more objectives that clarifies what you are trying to accomplish through your dissemination activities.
3. **Users:** Describe the scope and characteristics of the "potential users" that your dissemination activities are designed to reach for each of your objectives.
4. **Content:** Identify, at least, the basic elements of the projected content you have to disseminate to each of the potential user groups identified.
5. **Source(s):** Identify the primary source or sources that each potential user group is already tied into or most respects as an information source. Consider ways to partner with these sources in your dissemination efforts.
6. **Medium:** Describe the medium or media through which the content of your message can best be best delivered to your potential users and describe the capabilities and resources that will be required of potential users to access the content for each medium to be used.
7. **Success:** Describe how you will know if your dissemination activities have been successful. If data is to be gathered, describe how, when, and who will gather it.
8. **Access:** Describe how you will promote access to your information and how you will archive information that may be requested at a later date. Consider that most people will use your project-related information when they perceive a need for it – not necessarily when you have completed your research project.
9. **Availability:** Identify strategies for promoting awareness of the availability of your research-based information and the availability of alternate available formats.
10. **Barriers:** Identify potential barriers that may interfere with the targeted users' access or utilization of your information and develop actions to reduce these barriers.

The added value of knowledge dissemination is that its effect will increase awareness on a particular subject and allow for informed choices from amongst a group of alternatives. Dissemination does not include direct feedback from the audience but is a one-way flow of knowledge from the knowledge source to the potential market.

[12] Verite' Dissemination Planning Guide http://www.verite.org

<table>
<tr><th colspan="3">A2. End user Take Up of Research Results</th></tr>
<tr><td>Key partners</td><td colspan="2">1.Knowledge Product Providers
- Software Developers
- Technical Solutions
- Manufactures
- Installers
- R&D
2.Energy Providers
- Renewable Energy
3.Energy Retrofitting Services
- ESCO
- A&E</td></tr>
<tr><td>Key activities</td><td colspan="2">End-User mobilization Events,
Training & Education Actions,
Model (Demo) Solutions, or Web / Social Media</td></tr>
<tr><td>Key resources</td><td colspan="2">The specific knowledge transfer actions aim to inform building occupants and owners about the latest technological solutions and trends in the EE retro-fitting market. Real demonstration projects can also be designed and implemented based on viable business models where the investment necessary is set against the future economic as well as environmental benefits</td></tr>
<tr><td rowspan="2">Value Proposition</td><td>Tools

KTF Tool (ee-wise.eu)</td><td>Networks
http://energy.gov/articles/energy-saver-101-infographic-home-heating
http://www.ngridenergyworld.com/efficiency/t_book.html
http://www.youtube.com/watch?v=uSL5QmRKyOA</td></tr>
<tr><td>Tips for Effective Knowledge transfer
- Present learning material in a simple and concise manner, avoiding scientific language and technical jargon
- Make use of EC guidelines for research results dissemination for valuable feedback / ideas
- Employ Web conferencing / Webinar learning tools which offer options for online or offline (pre-recorded events) communication / training in remote locations
- Use simulation tools as another preferred option which can be produced in all fields through computer games, role-plays, or building models
- Create an immersive learning experience through simulation tools which are suitable for all people with different cultural backgrounds</td><td>Best Practices

- ECHO ACTION - to encourage active involvement of end-users, local economic actors, financial institutes, and local energy providers to facilitate the implementation of local energy plans.

- Social Housing Action - to reduce energy consumption through good practices sharing on retrofitting technologies that address energy concerns and changes in behaviour
-
- Take your energy back - to mobilize end-users through a Smart-e Buildings campaign (an interactive web portal linked to the main social networks like Twitter and Facebook).</td></tr>
<tr><td>Customer Relationship</td><td colspan="2">Automated Contact (Newsletter)
Online Contact (Webinars, web meetings, online conferences, Simulations, Blog- based learning)
Active Relationship (Personal Contact)</td></tr>
<tr><td>Channels</td><td colspan="2">Educational Material , Simulation Solutions, Leaflets , EE Technologies, Building Regulations and Certification</td></tr>
<tr><td>Customer Segments</td><td colspan="2">1. Demand
- Building Managers
- Occupants</td></tr>
</table>

A4. Managing Intellectual Property		
Key partners	**1.Knowledge Product Providers** - Technical Solutions - Manufacturers - R&D	
Key activities	- Re-evaluate the question of a single European ownership model especially for publicly funded research. - Initiatives originating from third-party organizations providing consultancy on knowledge sharing would be of further benefit to the business society. - Intellectual property training. Access to online journals some of which are open access and free.	
Key resources	The intellectual property of a company is one of the most valuable assets which can be used to fund new R&D projects, thus this KT solution is designed to make the business society aware of the available tools to manage IP rights in order to achieve innovation .	
Value Proposition	**Tools** KTF Tool (ee-wise.eu)	**Networks** http://www.escolimburg2020.be/ http://www.marie-medstrategic.eu/en.html https://www.youtube.com/watch?v=YR6ZGzNnemA https://www.youtube.com/watch?v=R2j-2HMTpJI
	Tips for Effective Knowledge transfer - Create the appropriate material that disseminates the Intellectual property procedures	**Best Practices** - ESCOLIMBURG2020- the project aims to accelerate and upscale the concrete implementation of energy efficiency and renewable energy measures in the public building stock by making use of an ESCO-model, relieving the local authorities from complex investment processes. - MARIE- to develop and adopt new regulatory requirements and new institutional tools to achieve the goals established by the new European Directive (EPBD); find new financial mechanisms that can be used to stimulate the thermal rehabilitation of buildings
Customer Relationship	Long-term relationship Automated Systems (Databanks) Automated Communication (Blog-based learning, Social networking sites, Community portals, Webinars, web meetings, online conferences, Mobile learning)	
Channels	Forums or trainings where experts from industry will discuss (explain) how Intellectual property can help the promotion and dissemination of new products and at the same time protect the investment.	
Customer Segments	**1.Public Bodies Finance** - Public Administration - Gov	

B1. Building Consortia & Energy Efficiency Networks	
Key partners	**1. Knowledge products & services:** - Software developers - Technical solutions - Manufacturers - R&D - Climate **2. Quality Assurance** - Patent Offices - Life Cycle Assessment
Key activities	- Formation of consortia and energy efficiency networks

	- Information transfer through media exposure, organization of exhibitions, documentation archiving, demonstration projects, training plans, networking - Creation of a EU-wide recognized standardization body.	
Key resources	Green Touch™: Basic Communications Systems The European platform for green building practitioners Energised communities	
Value Proposition	**Tools** KTF Tool (ee-wise.eu)	**Networks** https://www.youtube.com/watch?v=yfsDetHMiow https://www.youtube.com/watch?v=1WjBilqyTxU http://www.youtube.com/watch?v=cN6YrrqaLIM
	Tips for Effective Knowledge transfer - Should be created open discussions with moderators that will advise , learn how to deal with the topics - Keep always a visual explanation of how the EE system works and is installed. - Notice that even though the simulation tools are not the favourite choice for this Knowledge, a very fast simulated outcome on the results of EE will create lot of advantages	**Best Practices** The best method to start a cluster initiative online. The easiest way would be putting together other existing networks in each Mediterranean country. The networks related to each type of agent should be considered. The tool should establish a connection with other networks in the sector related to daily building practice and with innovation in EE retrofitting. Should provide K sharing opportunities online, such as forums, debates, etc, or a way to contact each other or publishing news.
Customer Relationship	Online Contact (Webinars, web meetings, online conferences Blog-based learning, social networking sites, community portals) Active Relationship (Personal Contact) (meetings)	
Channels	Presentations Podcasts Platform to create the forums and platform to create blogs	
Customer Segments	**1. Public Bodies & Finance** - Public Administration - Standardization **2. Knowledge products & services:** - Installers **3. Energy providers:** - Renewable energy - Energy distributors - Grid operators **4. Energy & Retrofitting services** - ESCO´s - Architects and engineers - Audit firms	

B3. Clustering of Retrofit Market Solutions	
Key partners	**1. Knowledge and Products Providers** - Technical Solutions Developer - Manufacturer - R&D
Key activities	Create regional networking of companies working in retrofitting innovation.
Key resources	Guidelines to be implemented in different type of activities such as: videos podcasts forums and training material regarding the use of the proposed solution.

Value Proposition	**Tools** KTF Tool (ee-wise.eu)	**Networks** ww.powerhouseeurope.eu/nc/cases_resources/case_studies/single_view/?tx_phecasestudies_pi3%5Bid%5D=106
	Tips for Effective Knowledge transfer - Keep always a visual explanation of how the EE system works and is installed. - Notice that simulation tools are the favourite choice for this Knowledge, so software developers need to get involved. - Use videos apart from the e-material to disseminate EE building components and systems if you are a solutions designer. - Experimental building projects have a lot of useful demonstration material for EE training. - If you are related to an experimental building, allow visitors for a living demonstration in order to produce impulse the training experience and assist connecting EE directly to the market. - Keep the experimental building updated by collaborating with solutions designers to test their EE measures.	**Best Practices** - Case study: AID system for Thermal Refurbishment of Social Housing Stock in Champagne Ardennes Region- Identifications of needs; Implementation of the partnership, Support to project managers, Financial Engineering, Funding and monitoring of project. - Case Study: Arte Genova Pilot Via Sertoli,9- Shelter Project: maintain the thermal comfort conditions inside the units; reduce heat loss; assess, the energy efficiency of each dwelling.
Customer Relationship	Online and Automated Systems (Video in learning courses, Webinars, web meetings, online conferences, Online forums) Active Relationship (Personal Contact)	
Channels	Material required for this issue are video clips about retrofitting, presentations bout how society deals with energy efficiency. Topics that cover the needs the retrofit.	
Customer Segments	**1.Public Bodies & Finance** - Public Administration - Government **2.Knowledge and Products Providers** - Installer **3.Demand** - Occupant - Building Manager **4.Energy Providers** - Renewable Energy - Energy Distributor	

B4. Connecting Commercial Advice to EPBD Activity	
Key partners	**1. Energy & Retrofitting services** - ESCO´s - Architects and engineers - Audit firms **2. Demand** - Occupants
Key activities	Commercial advice in line with national EPBD requirements Clustering framework Offering the relevant and complete information to the consumers
Key resources	

Value Proposition	**Tools eg KTF Tool (ee-wise.eu)** KTF	**Networks** http://www.youtube.com/watch?v=GHk2Tk9E6AI http://www.building.co.uk/is-the-government-ready-for-the-epbd?/5036193.articleB4
	Tips for Effective Knowledge transfer - Use Podcasts as a less expensive tool to offer a mobile, interesting and convenient way for accessing information / training material - Employ Web conferencing / Webinar learning tools which offer options for online or offline (pre-recorded events) communication / training in remote locations - Include Online Forums and Podcasts in your "toolbox" as two other popular options - Please bear in mind that the audience is technically competent so scientific jargon maybe used in the learning material	**Best Practices** - ENEA - Entrusting the role of providing commercial advice in line with national EPBD requirements to competent National Agencies - FOREST - Carrying out networking and clustering actions - PadovaFIT! - Offering complete information to the consumers through pilot retrofit projects
Customer Relationship	Active Relationship (Personal Contact) (meetings) Online Contact (Webinars, Web Meeting, Online Conferences, Online forums. Podcasts (audio lectures)	
Channels	Educational Material, Audio Lectures, Brochures, Leaflets, Data concerning EE Technologies and Building Regulations and Certification	
Customer Segments	**1. Public Bodies & Finances:** - Public Administration - Government - Standardization **2. Knowledge products & services:** - Software developers - Technical solutions - Installers **3. Energy & Retrofitting services** - ESCO´s - Architects and engineers - Audit firms	

D2. Support Industry in R&D Take-Up	
Key partners	**1.Knowledge Product Providers** - Technical Solutions - Manufactures - Installers **2.Energy Providers** - Renewable Energy **3.Energy Retrofitting Services** - ESCO **4.Quality Assurance** - Certificate Entries
Key activities	- The development of appropriate financial instruments to promote the installation of energy efficient housing and retrofit technologies - Control of the eligibility to make use of the financial benefits in each country could be done through a measurement of the building energy efficiency level - Set up of beneficial grants, green loans and tax revisions (value added tax, property tax, income tax).

<table>
<tr><td>Key resources</td><td colspan="2">As many research efforts are frustrated and remains ideas or theoretical data that can't be developed into products, the aim of the KT solution is foster the financial support to the industry in order to market up take the scientific results into products.</td></tr>
<tr><td rowspan="2">Value Proposition</td><td>Tools

KTF Tool (ee-wise.eu)</td><td>Networks
http://www.eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=1519
https://www.youtube.com/watch?v=Ax0oooYAQLc
https://www.youtube.com/watch?v=K7y50oT7Rio#start=0:00;end=6:16;cycles=-1;autoreplay=false;showoptions=false</td></tr>
<tr><td>Tips for Effective Knowledge transfer
- Financial Institutions has to communicate the new financial products
- Financial institutes has to be close to the EE Market and Industry
- Development of appropriate financial instruments to foster cooperation between industry and R&D entities.
- These instruments can for example include the setting up of grants for promotion of innovative products, tax revisions on items related to innovation sourcing (e.g. attendance to expo fairs, seminars, and patent fees).
- To control financial benefits, it might be appropriate to install an associated quality assurance scheme to ensure the actual diffusion and implementation of the retrofit.</td><td>Best Practices
Educa-RUE, through a number of interconnected actions, will develop an optimal process to be applied and replicated at local level. The project will develop actions for the qualification of the technicians and certifiers which will have a key role in the implementation of the Directive on local building. Educa-RUE will study possible improvements in the applicative procedures of the Directive, supporting and enhancing specific financial tools and procedural incentives to promote the more efficient use of energy in building As the project will act upon a range of problem areas such as legislation, certification, education, economic and financial issues, training, information and dissemination, the first direct beneficiaries of the project results will be local policy makers. The involvement of local government players is ensured by the composition of the partnership belonging to 4 EU countries and the attention focused on the issue of energy efficiency at local level. The Local levels will act, where existing, through the collaboration of Local energy agencies, ensuring technical support an eventually training capacity.</td></tr>
<tr><td>Customer Relationship</td><td colspan="2">Long-term deep relationship
Active Relationship (Personal Contact)
Online Contact (Webinars , Web meetings, Online conferences, Communication Tools, Blog – based learning, social networking sites, Community portals)</td></tr>
<tr><td>Channels</td><td colspan="2">Brochures how to interact with financial institutions, Leaflets about financial products</td></tr>
<tr><td>Customer Segments</td><td colspan="2">1.Public Bodies & Finance
- Financial Agents
- Gov
2.Demand
- Occupants</td></tr>
</table>

D3. Support Occupant in Retrofit Take-Up	
Key partners	**1. Public Bodies & Finance** - Pub A - Gov. **2.Quality Assurance** - Certificate
Key activities	- The development of appropriate financial instruments to promote the installation of energy efficient housing and retrofit technologies - Control of the eligibility to make use of the financial benefits in each country could be done through a measurement of the building energy efficiency level

<table>
<tr><td></td><td colspan="2">- Set up of beneficial grants, green loans and tax revisions (value added tax, property tax, income tax).</td></tr>
<tr><td>Key resources</td><td colspan="2">Create forums or trainings where experts from R&D, Finance institutions will discuss (ex plain) the need, opportunities to invest in EE retrofitting technology.

Financial institutions should create new products optimal for different occupants, and also government can reduce taxation in energy efficiency buildings</td></tr>
<tr><td rowspan="2">Value Proposition</td><td>Tools

KTF Tool (ee-wise.eu)</td><td>Networks
- www.warmupnorth.com/
- www.eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=2533
- http://www.youtube.com/watch?v=P9l8zingLjE
- http://www.youtube.com/watch?v=W_YIrxBHukM</td></tr>
<tr><td>Tips for Effective Knowledge transfer
- The produced material that promotes the financial products has to be in a understandable form the Occupants perspective.
- The Financial products has to be transparent
- Notice that simulation / games tools are not among the favorite choice for this Knowledge, but it can be easy for the occupants to understand the Pros /Cons of the EE retrofitting technology
- Use videos apart from the e-material to disseminate EE building components and systems if you are a solutions designer.
- Experimental building projects have a lot of useful demonstration material for EE training.
- If you are related to an experimental building, allow visitors for a living demonstration in order to produce impulse the training experience and assist connecting EE directly to the market</td><td>Best Practices
Newcastle City Council (NCC) is a signatory of the Covenant of Mayors since January 2008. Following the City Climate Change strategy and the Sustainable Energy Action plan (SEAP) both approved in October 2010, the Council is actively involved in developing and implementing actions to meet the SEAP targets. Technical assistance is provided for the delivery of a large scale, city wide, cross tenure housing retro fit program of energy efficiency and renewable measures. The investment and financing model is based on 10,000 to 15,000 homes to be retrofitted and will start with a first phase on targeting 5,000 homes over the 3-year project period. The investment scheme is based on the UK Green Deal and the project will set up a delivery body to carry out the retrofitting program. NCC is leading on this development work as a "pathfinder" for all the Local Authorities in the North East of England Region</td></tr>
<tr><td>Customer Relationship</td><td colspan="2">Online Contact (Communication Tools, Webinars, Web meetings, Online Conferences, Video in Learning Courses)
Active Relationship (Personal Contact)</td></tr>
<tr><td>Channels</td><td colspan="2">Information about how to interact with financial products</td></tr>
<tr><td>Customer Segments</td><td colspan="2">1.Public Bodies & Finance
- Financial Agents
2.Demand
- Occupants</td></tr>
</table>

<table>
<tr><th colspan="3">E1. EC Guidelines for R&D to Address End-User Knowledge Needs</th></tr>
<tr><td>Key partners</td><td colspan="2">1.Public Bodies & Finance
- Public Administration
- Government
2.Knowledge and Products Providers
- Technical Solutions Developer
- Software Developer
- Installer
- Manufacturer
3.Energy and Retrofitting Services Providers
- Architect & Engineer
- Audit
- ESCO
4.Quality Assurance
- Certificate Body
5.Demand
- Occupant
- Building Manager</td></tr>
<tr><td>Key activities</td><td colspan="2">- Professional knowledge brokers
- Knowledge transfer at a cluster level
- Clear definition of the end-user/target groups</td></tr>
<tr><td>Key resources</td><td colspan="2">- Model solutions for policy, funding mechanisms, products and services
- Common guidelines and policies to improve the competitiveness of innovative and sustainable models for housing that respond to the challenges of a growing population.
- Development of a common model/strategy for training, certification and knowledge dissemination.</td></tr>
<tr><td rowspan="2">Value Proposition</td><td>Tools

KTF Tool (ee-wise.eu)</td><td>Networks
http://www.marie-medstrategic.eu/en.html
http://www.irh-med.eu/
http://www.educarue.eu/</td></tr>
<tr><td>Tips for Effective Knowledge transfer
- Include references to the feedback received from users (public bodies, product / service providers, quality assurance, occupants) in the guidelines
- Provide direct audio or/and video connection between the trainers and the trainees
- Use Web conferencing / Webinar as another option
- Enable communication / training in remote locations through web conferencing events, meetings, workshops
- Provide either a recorded copy of the event, or a means for a subscriber to record the event.</td><td>Best Practices
- MARIE - Mediterranean Building Rethinking For Energy Efficiency Improvement. The mission of the MARIE project is to co-construct a strategy for energy efficiency in existing buildings in the Mediterranean region.
The main idea to replicate here is the development of a model “solution” regarding policy, funding mechanisms, products & services.
- IRH-Med - Innovative Residential Housing for the Mediterranean. The idea here is to develop common guidelines & policies to improve the competitiveness of innovative and sustainable models for housing that respond to the challenges of a growing population.
- Educa-RUE - Energy Efficiency Paths in Educational Buildings. The project will develop actions (legislation, certification, education, finance, training, information and dissemination) for the implementation of the Directive on local building. Again here the idea is to develop a common model/strategy, but Educa-RUE is more elaborate and addresses also training, certification and dissemination.</td></tr>
<tr><td>Customer Relationship</td><td colspan="2">Automated Systems (questionnaires, customer feedback)
Online Contact (Communication Tools, Webinars, web meetings, online conferences, e-books)</td></tr>
<tr><td>Channels</td><td colspan="2">EC guidelines on dissemination / exploitation of research project results in an appropriate format (webinars, online forums, blog based learning, e-book)</td></tr>
</table>

Customer Segments	**1. Knowledge and Products Providers** - R&D

3.6. Conclusion

On the basis of the information presented in the preceding tables, it appears that the needs for clustering EE retrofitting technologies, providing continuous training of both users and providers, and enhancing information sharing for both users and providers in the value chain are fundamental factors in improving knowledge transfer and reaching the EU targets for energy saving

4. PRACTICAL PROCEDURES, RECOMMENDATION, GUIDELINES PER THREE FOLD APPROACH FOR MARKET UP-TAKE

This section aims to provide practical guidelines, procedures and recommendations that serve the purpose of facilitating and promoting the rate of market up-take within the building society.

Table 6 described previously in Chapter 0 has split the knowledge transfer needs into the 3-fold approach of Knowledge Generation, Knowledge Sharing and Knowledge Dissemination. When considering the relevance of the knowledge transfer needs for market up-take a further sub-categorisation of the needs can be made as shown in Figure 10 below. Recommendations, practical procedures and guidelines shall be provided for each of the sub-categories.

The knowledge transfer needs sub-categories for market up-take of EE retrofitting are:

- Training

  This sub-category includes all knowledge transfer needs related to training. The training provider and the training receiver may be various agents within the value chain and the training content and methods may differ depending upon the particular training necessity that will assist in incentivising market up-take.

- Market Contact

  This sub-category includes all knowledge transfer needs related to bringing the technology, its technical details, primary benefits to energy efficiency and all related research results to the final market user. The main aim of these knowledge transfer needs is to identify the added-value that the retrofit technology presents to the user and focus the knowledge transfer and the research activity on these aspects.

- Financial Support

  This sub-category includes all knowledge transfer needs related to financing of market up-take within the EE Retrofitting sector.

- Clustering & Networking

  This sub-category includes all knowledge transfer needs related to facilitating the interconnection between the value chain agents in order to simplify the knowledge transfer process and allow a higher penetration level of implementation of the EE retrofit solutions into the building stock.

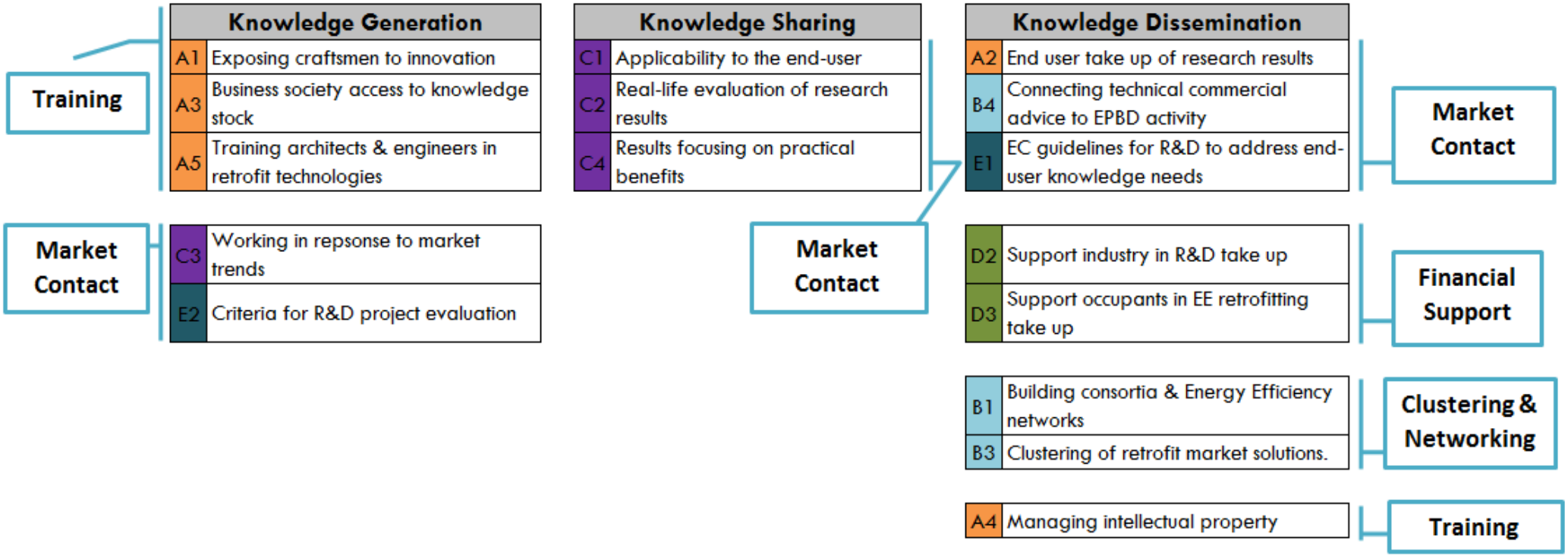
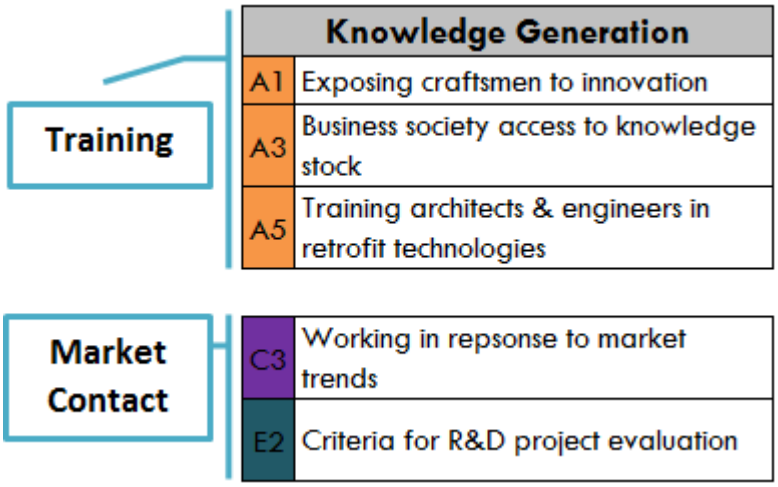


Figure 9 – sub-categories for the knowledge transfer needs related to market up take measures within the 3-fold approach

4.1. Procedures, Recommendations & Guidelines for Knowledge Generation

The knowledge transfer needs that belong to the Knowledge Generation approach are:



Recommendations, procedures and guidelines for each of these needs are detailed below.

4.1.1. Training (Knowledge Generation)

The most easily accessible agents that can effectively deliver and assist in the implementation of the retrofit solutions within the building stock and be catalysts to mobilising the EE Retrofit market are the construction professionals (including architects, civil engineers, building services engineers, project managers, building designers, etc), the traditional craftsmen and the business society. These value chain agents are those that are engaged in direct contact with the building occupant during a building retrofit project and thus need to be equipped with the necessary knowledge on EE Retrofitting in order to be in a better position to provide the required knowledge and implement the retrofit solutions in the maximal energy-saving manner.

The procedures, recommendations and guidelines in this scenario are:

- To include advanced energy analysis methodologies and study of retrofit technologies and their adaptations to the building variations at the **higher education** institutions for construction professionals (i.e. architects, civil engineers, building services engineers, project managers, building designers, etc.). This will involve an increased and adapted curriculum for Bachelors and Masters Degrees in energy efficient construction technology.

- For those construction professionals that have already qualified from the educational institutions and are currently active within the industry, **short and specialised courses** together with other **informal learning events** such as seminars and workshops would serve to provide further educational opportunities.

- Traditional craftsmen, who are in most cases not hailing from a higher level educational institution, would benefit from experiencing implemented EE retrofit solutions on a first-hand basis through the availability of **demonstration projects**. The craftsmen would come into contact with the technology, its installation procedure, and also the resulting energy benefit achieved through implementation of the EE Retrofit could be observed. These demonstration projects could also present tools to the traditional craftsman that will aid in the decision making process on which retrofitting technologies is most suited for a particular residence.

- Within the business organisations, there is the need to have a Continuous Professional Development program in place that will constantly build on the staffs' **knowledge transfer training program**. Professionals who are qualified in knowledge transfer methods should be involved to assist in this training process thus allowing the business to attain staff that is able to keep abreast with sourcing and investigating the advances in innovation and in obtaining knowledge from the other value chain agents. This will in turn improve the overall quality of employees, their professional level and working enthusiasm.

- The creation of the post of **Knowledge Transfer Officers** within a business organisation would facilitate the organisation's ability to tap into the knowledge base, utilise the knowledge obtained internally within the organisation, and promote the knowledge to the market in the most effective way. An added solution to this recommendation is to build a recognised and accredited educational framework that will provide a qualification to the new generation of knowledge transfer officers.

The implementation of these procedures, recommendations and guidelines will lead to an increased level of education within the value chain agents that could transfer the knowledge directly to the market. The providers of these educational opportunities are varied and could include the public administrative bodes, the retrofitting solutions manufacturers and the educational bodies.

4.1.2. Market Contact (Knowledge Generation)

The research bodies existing within the academic and business societies need to be in contact with the market in order for their activity to be better geared up to adapt to the market changes and thus be able to provide products that are better suited to the building stock and to the customers' expectations. Market research is important in order for the research bodies to assess the market trends, identify those products that are currently employed for EE retrofitting and investigate ways of improving those technologies. Furthermore, if some aspects of building retrofitting are not being tapped into due to factors such as low performance, high level of intrusion during installation, short life span, etc., then the research bodies could take the initiative to develop those technologies and attempt to make them more attractive to the building owners.

The procedures, recommendations and guidelines in this scenario are:

- The formation of **academic-industry collaborations** will enable the research bodies to get hands-on information about the market trends. Having information on which technologies have the most market up-take rates would allow the research bodies to direct their efforts in the most effective direction by improving on the current technology. On the other hand, an investigation into why other technologies are not experiencing substantial market up-take could be initiated and result in new research being done in these areas.

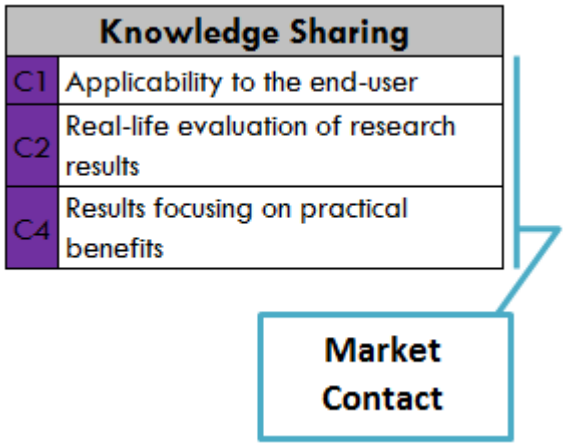
- Publicly funded EE Retrofitting research projects should include a specific percentage of the **budget that is allocated to knowledge transfer**, which is non-transferable to other sections of the project. This budget will be utilised for supplying the research results to the market and thus increasing the knowledge of the value chain actors. This budget allocation could also be used for the publication of patents if desired, thus making the technology and results accessible to the end-users.

- Proposal writing for EE Retrofitting research projects to be funded by public funds should include a definition of who the end user(s) of the technological results are. These end users will then be involved in the **evaluation of the research projects** by including project evaluation criteria that will rate the use of the final results of the project from the end user perspective. An added value to this proposal is that by involving the end users and relevant stakeholders at all stages of the research lifecycle, including the research agenda, will ensure that the research activity meets their needs.

Modifications and improvements to the innovation that are resulting from a change originating in response to market feedback, will lead to improving the competitiveness and adaptability of the innovation. Thus it is in the interest of all the value chain actors, not only of the research bodies, to form academic to industry and end-user collaborations to improve the effectiveness of the innovation process and the technologies produced therewith.

4.2. Procedures, Recommendations & Guidelines for Knowledge Sharing

The knowledge transfer needs that belong to the Knowledge Sharing approach are:



Recommendations, procedures and guidelines for each of these needs are detailed below.

4.2.1. Market Contact (Knowledge Sharing)

The presence of knowledge that is only resident at the academic institutions or research bodies is isolated and cannot be realised to its full potential within the EE Retrofitting market until the moment when it is shared with the rest of the value chain. It is therefore paramount that knowledge is shared from the R&D agents to the rest of the value chain agents. Furthermore, it is important that such knowledge is shared in a way that is understandable by the market and aimed in a way to showcase

the maximal benefits that could be achieved through the implementation of the researched retrofit technology.

The procedures, recommendations and guidelines in this scenario are:

- When writing up **technical data-sheets** relevant to new retrofit technologies and products, which are to be presented to the market, a high focus needs to be given to elaborate and describe the practical benefits which the technology will contribute to the overall building energy consumption and to the living conditions within.

- **Knowledge sharing events** that are sponsored by the institutions and public administrations would serve to create an effective solution to encourage peer-to-peer knowledge transfer through the value chain. The results of the technological advances registered at the R&D bodies can be effectively showcased to the rest of the value chain.

- The creation of a **research bank of buildings** that are put forward by the building owners for the purpose of evaluating the results from the research organisations would allow for actual testing of the technology in real-life situations away from the laboratories. This collaboration effort between the end users and the R&D community would benefit the market up-take and the extent to which the market gets to learn about the technological advances in EE Retrofitting methods and products. Depending on the building criteria required by the R&D activity, the building will be chosen and the retrofitting technology implemented while offering the building owners reduced rates for the material procurement and installations through government funds or reduced rate loans. The end user should obviously be made aware that the technology is to some extent in experimental stage and should therefore know the limitations and regulations of consumer rights as applied to this scenario.

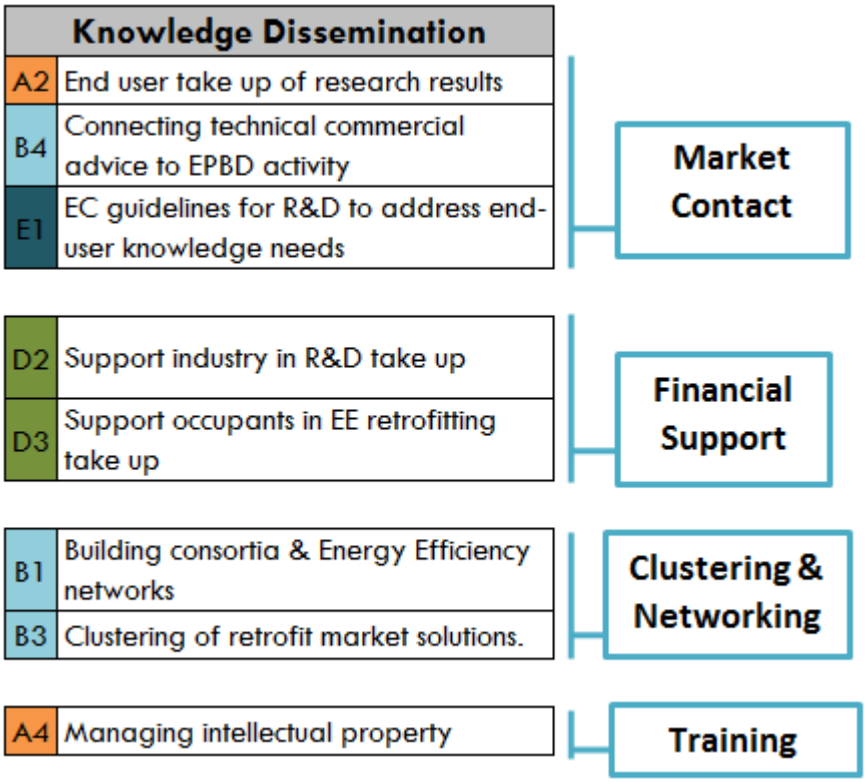
- Including **communication skills training** in R&D Continuous Professional Development (CPD) initiatives. The training would provide clear objectives of knowledge transfer clusters and identification of potential audiences for the research results at hand together with methods for communicating results effectively depending on the target market.

- Extension of the **evaluation criteria** of a researcher's R&D activity to include also activities that serve to communicate the research results to the market. Although it is recognised that the time taken up for communication events is time taken from research activity, it is also vital to the researcher him/herself to expose the research results to the industry and other value chain members and receive feedback on the developments presented. These efforts for dissemination should have a defined within the evaluation criteria of the researcher's activity by the research administering body.

Whilst there is a need for knowledge sharing within the value chain for exposing research results and also for guiding the research activity, there is also a thirst from the value chain members to get information about the latest technological developments and to implement and evaluate the retrofit technologies in the building stock. Therefore, knowledge sharing is an important activity for all value chain members.

4.3. Procedures, Recommendations & Guidelines for Knowledge Dissemination

The knowledge transfer needs that belong to the Knowledge Dissemination approach are:



Recommendations, procedures and guidelines for each of these needs are detailed below.

4.3.1. Market Contact (Knowledge Dissemination)

The knowledge dissemination to the market that is to showcase the advances in EE Retrofit technologies and procedures for improved energy efficiency of buildings is vital to the rate of market up-take. When information is disseminated effectively and coherently, the chances of up-take is increased since the final users will be confident in having complete and true information about the technology that they are installing in their buildings. Therefore, it is vital that the information relayed to the market follows strict rules governing coherency, validity and suitability as described in Section **Error! Reference source not found.Error! Reference source not found.**5.2.

Furthermore the procedures, recommendations and guidelines in this scenario are:

- Ensuring that the **technical commercial advice** available to the market is in line with the EPBD requirements for the country. When a building owner goes through the building certification process that includes advice on methods to improve the building energy consumption, there must be a connection between the technical commercial advice available and the technical auditing advice provided in order for the owner to better relate to the technologies available for improving the building energy performance. Where possible, technical commercial jargon

should also include examples of energy performance observed reductions for actual buildings in order to better connect to the energy certification.

- The creation of a **clustering framework** in which the public authority could guide the business society about what information is required by the building owners as specified by the EPBD directives for the country. It will then be in the business society's interest to keep competitive by offering the relevant and complete information to the market that is aiming to achieve better energy performance certification for the existent building stock.

- **Marketing, educational events and promotion** of the latest technological innovations will increase the end users' awareness of new retrofitting technologies and motivate them to choose products with the best energy efficiency and the best comfort parameters. These events could be organised through clustering efforts from public authorities and business partners to create showcasing events open to the general public.

- A substantial amount of research activity is being done within the various funding programs managed by the European Commission. This presents an opportunity to target these research projects with a **set of guidelines** aiming to improve the knowledge dissemination for each of the R&D projects. This set of guidelines regulating the information flow within a EU funded research project could include:
    - having professional knowledge brokers available to assist in the organization of dialogue events to pass on results of research projects
    - strategies to implement knowledge transfer at a cluster level and not only at project level
    - a clear definition of the end-user/target groups for a particular project defining their needs and potential in order to be able to disseminate coherent knowledge resulting from a research project that will be included in the public deliverables.

Even though the market may be motivated to invest in EE Retrofit solutions for the existent building stock, a major part of the decision making process on which solutions to implement and where can only be solved by having information that is accessible on demand. Increased availability and dissemination of the information generated by the R&D institutions and service companies is necessary for this information take-up.

4.3.2. Financial Support (Knowledge Dissemination)

The main objective of financial support for knowledge dissemination is to give value chain agents the capacity they require in order to be able to access, learn about and implement EE Retrofit solutions into the building stock.

The procedures, recommendations and guidelines in this scenario are:

- The development of appropriate financial instruments to promote the installation of energy efficient housing retrofit technologies that utilise the latest technological advances is

recommended. These instruments can for example include the setting up of **beneficial grants, green/soft loans or tax revisions** (lower value added tax, property tax, income tax). Control of the buildings' eligibility for utilising the financial benefits in each country could be done through a measurement of the building energy efficiency level as assessed by the certification bodies in line with the EPBD standards for the country. There could also be a ratio between the EE level and the amount of the financial benefits granted to the occupant where the higher the level to be obtained through implementing retrofit the more financial benefits could be offered. This will also serve as a motivation for the end user to aim for a higher level of energy efficiency and increase the market up-take.

- Offering the opportunity for **building stock within an identified area**, the possibility to pool together to achieve sufficient volume that will make a profitable investment proposal for ESCO companies to step in and implement retrofit as an investment opportunity. One public administration or private entity will gather the signatories of the building pool with agreement to undergo the retrofit project. The pool will group together buildings with similar characteristics and the project may be based on actual implementation of retrofit or even on educational campaigns promoting retrofitting and energy savings. This aggregation of buildings is favourable to the ESCO since risks are balanced out with a failure on one building being balanced by better results on the other buildings, so that the overall contractual targets are respected.
- The development of appropriate **financial instruments to foster cooperation between industry and R&D entities.** These instruments can for example include the setting up of grants for promotion of innovative products, tax revisions on items related to innovation sourcing (e.g. attendance to expo fairs, seminars, patent fees, etc.). Control of the financial benefits, might be done through the setting up of an associated quality assurance scheme to ensure the actual diffusion and implementation of the retrofit.

The source of the financial tools does not necessarily have to be the public administration bodies (through tax incentives and grants) but it might also originate from the private sector with for example banks offering specific funds to meet the financial needs of the knowledge transfer activities necessary for market up-take. In general the most important challenge for market up-take is convincing the building owners to recognise the business case of retrofitting existent buildings to high energy standards by not only explaining the advantages in terms of living conditions but also, the pay back periods for recovering the costs of the retrofit project.

4.3.3. Training (Knowledge Dissemination)

The value chain agents responsible for knowledge dissemination need to have the necessary skills and abilities to do so. Therefore, training and development in this area is necessary to ensure effective dissemination with the required information being delivered to the market. However, above all this, the

value chain agents require having their intellectual property rights protected and it is here that it is necessary for the agent to know his rights and to learn about the methods for protecting his property.

Knowledge sharing between R&D entities may include open access, open publications, open software, etc. These mechanisms can ensure a more effective dissemination of results although in certain cases formal protection (e.g. design rights, patents or material transfer agreements) may be necessary if a product is to be brought to market successfully.

The procedures, recommendations and guidelines in this scenario are:

- Organisation of **information sessions** amongst EU member states to demonstrate the possibilities of open information and formally protected information. It is important to ensure that researchers are aware of the benefits of both approaches and that decisions are made on the basis of socio-economic impact.
- Given that the rules governing the **ownership of publicly-funded R&D results** still vary across Europe, it may be appropriate to revisit in the near future the question of a single European ownership model especially for publicly funded research. Efforts in this area have already begun and it would help the retrofitting sector, as well as other sectors, to finalise and implement this setup across EU countries.
- **Consultancy services on knowledge sharing** procedures and initiatives offered by third-party organisations would benefit the business and R&D societies.

When the research and business entities are not confident with their level of protection for their intellectual property, they will hold back information to the detriment of the market. Education and facilitation of intellectual property rights is vital.

4.3.4. Clustering & Networking (Knowledge Dissemination)

When value chain agents are working together in collaborative efforts whether they are long-term or even project-based, it will be easier for knowledge dissemination to occur. Having a strong market base will facilitate the flow of information about EE Retrofit solutions to the end-users.

The procedures, recommendations and guidelines in this scenario are:

- The **formation of consortia and energy-efficiency networks** connecting policy makers, governments, non-governmental organizations, universities, companies and other institutions involved in research and innovation would offer the potential of increasing knowledge dissemination by showcasing the results of R&D and aiming to increase the market up-take in line with the regulations and national targets set by those involved in setting up and enforcing the regulatory framework. Many possibilities would exist for information dissemination through media exposure, organisation of exhibitions, documentation archiving, demonstration projects, training plans, networking, etc. A scenario could also be created in which it would be

obligatory for governments, non-governmental organizations, universities, companies and other institutions to join these networks through an EU-wide recognised standardisation body.

- It is recommended to create **regional networking of companies** working in retrofitting innovation, since this can lead to a diffusion of innovative technologies due to its social impact. The added benefit of this is that the networking efforts in themselves can also create synergies to stimulate more innovation.

Clustering and networking efforts should not be restricted only to the higher levels of the value chain such as producer, technical solutions company, etc. but it is also important to include contributions from the level of the traditional craftsmen. Clustering efforts that are active at all levels will encourage improved market up-take of retrofit solutions with information flowing more easily to the end-user.

4.4. Conclusions

This document has presented a substantial amount of guidelines and action recommendations for each of the aspects of the three-fold approach: Knowledge Generation, Knowledge Sharing and Knowledge Dissemination with the aim of mobilising the knowledge transfer through the value chain and promoting market up-take for EE Retrofitting within each country. All of the guidelines and recommendations need to be actively pursued and improved upon with concrete actions aiming at incentivising and enabling knowledge transfer through the EE Retrofitting value chain.

Each of the value chain agents have their own motivation, agenda, time-scale and aspirations, and without the development of open channels of communication this barrier of a cultural divide will remain. The basis of effective knowledge transfer is founded in educating all value chain actors to recognise the importance of actively participating in the dissemination and sharing of knowledge through the whole chain and in cooperating together in knowledge generating activities.

One cannot identify any recommendation as being more important over the others since all recommendations target different user groups and different aspects of knowledge transfer flow. In general however, it must be stated that each of the value chain actors stand to gain from efforts carried out for improving market up-take.

5. COMMUNICATION PLAN TO DISSEMINATE EE RETROFITTING EFFORTS TO SOCIETY

The ee-WiSE project and its partners are collaborating to provide guidelines towards a community outreach and European-wide advertising to leverage efforts and raise public awareness about the importance of energy efficiency in homes. This document is based on various publications arising from the Energy Upgrade California program - http://energyupgradeca.org/en/.

5.1. Campaign goals and structure

Although the ee-WiSE project deals with EE retrofitting in Mediterranean countries, each country has its own variations with regards to building materials used, building techniques employed, climatic conditions, etc. Therefore, before venturing on a communication strategy to society, one must initially assess the possibilities of implementation of the EE retrofitting technology concerned vis-à-vis the building stock of the particular country. Should the EE retrofitting technology be easily implemented across all Mediterranean countries, then one might decide to target multiple countries in the communication strategy.

A particular innovative product or technology might be suited for a certain building technologies with specific building materials but not for others. Therefore, it is very important to provide information that can be useful to the occupants and not communicate something that cannot be implemented within the building stock due to physical constraints.

Once the situation analysis is written and completed, there is a basis on which to build the strategic communication activity. Documentation of the strategic summary must set clear goals and tasks. Goals are high-level concepts about what needs to be accomplished, such as improving the building stock energy performance through the introduction of particular technologies. In relation to each of the goals, a number of tasks are set with the aim of making the goals a reality. Each task should be SMART (Specific, Measurable, Attainable, Relevant and Time-Bound)[13] to accomplish the goal it serves.

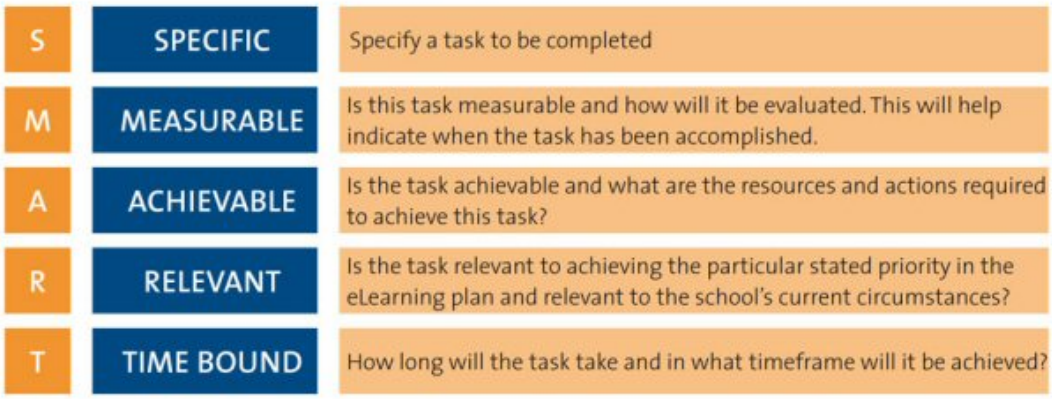


Figure 10 SMART – methodology for task setting

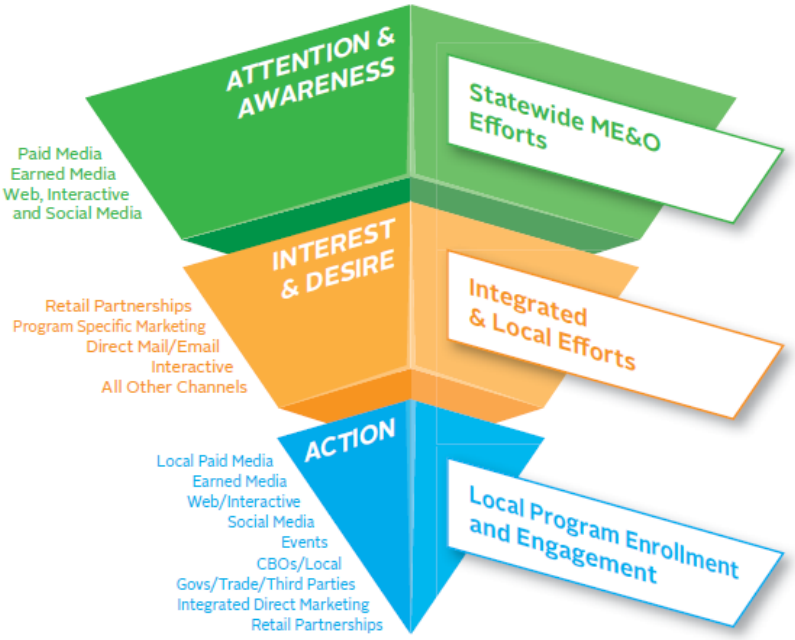
[13] George T Doran, Management Review Nov 1981

In formulating tasks, the communicator must consider an overall strategy that will effectively reach the target occupants by using the mixture of appropriate communication tools as shall be discussed. A mixture of tactics that have the highest credibility with target audiences is always better than only one or two tactics that might not reach out to all the occupants.

Usage of GANTT charts work well when plotting out timeframes for implementation of the communication strategy.

The marketing and outreach plan provides a structure on how value chain actors can engage with property owners through effective strategies, while providing clear and compelling information about the benefits of an energy efficiency retrofit. The marketing and outreach plan has five major goals:

1. Build broad, positive awareness of the Campaign
2. Educate property owners to overcome barriers to participation
3. Target marketing efforts to drive participation by key audiences, identified in surveys
4. Align and coordinate other marketing efforts by utilities and other partners
5. Create a sustained market for a whole-house performance approach, leading to long-term behavioural change



5.1.1. Objectives

The Plan is designed to achieve these major objectives:

1. Establish and ensure campaign goals are met:
   - Establish target figure for participants that enter the Campaign as a result of marketing and outreach efforts.
   - Establish target figure for participants that enter the Campaign as a result of

marketing by contractors (using messaging and materials developed through this Plan).

- Establish target figure for participants that enter the Campaign as a result of marketing by other methods such as realtors, retail partners, architects, designers, and City efforts (using messaging and materials developed through this Plan).

2. Establish target figure for unique hits on a robust website (or calls to a call centre).
3. Create a virtual "word-of-mouth" buzz created through social media, resulting in click-through to the campaign website.
4. Provide communications kits available for European cities, community leaders and environmental groups.
5. Provide marketing kits for partners (contractors, realtors).
6. Ensure Informational materials are placed with retailers, cities, local councils.
7. Establish target media/advertising/person impressions through:
    - Mainstream media (television, radio, print) stories placed
    - Multicultural media (television, radio, print) stories placed
    - Radio/TV PSAs placed
    - City TV Campaigns placed
    - Paid radio, TV promos, ads
    - Paid print ads
    - Community meetings
    - Targeted direct mail
8. Consolidate information in a "one-stop shop" approach, where and when possible.

5.1.2. Incentives and financing

Market research suggests that subsidies and/or rebates are primary motivators for homeowners to undertake an energy upgrade or retrofit. Subsidies and rebates across the Member States are available for consumers from various sources. A typical subsidies and rebate table should be completed for the target country and target technologies right at the onset of the campaign.

5.1.3. Coordination between local government and utilities

Consumers should be best served by a unified brand and consumer marketing campaign, consistent messaging and a state-wide website portal with one website address. Coordination should also leverage resources and increase the marketing effectiveness of local governments and the local utilities. All materials should be developed collaboratively and costs should be shared according to the division of responsibility and interest where relevant.

5.2. Identifying target audiences and locations

The Communication of the project to society is pivotal in assuring the project's impact and needs to emphasise the relevance of the energy efficiency, relevant actions, events and the project's content. The Communication Plan (CP) is entirely research-driven, focusing on property owners which are most likely to undertake a home energy retrofit.

Figure 11 below illustrates a building owner's decision-making process for undertaking renovation work. In summary, there is a multiplicity of reasons why building owners do not routinely consider options for improving their home's energy performance, and even when there are convenient "trigger points", the energy saving options can often be overlooked, ignored, rejected or only partially realised. From the consumers' viewpoint, it is important to consider their decision-making process, especially the most prevalent barriers for a given scenario as indicated in the final column.[14]

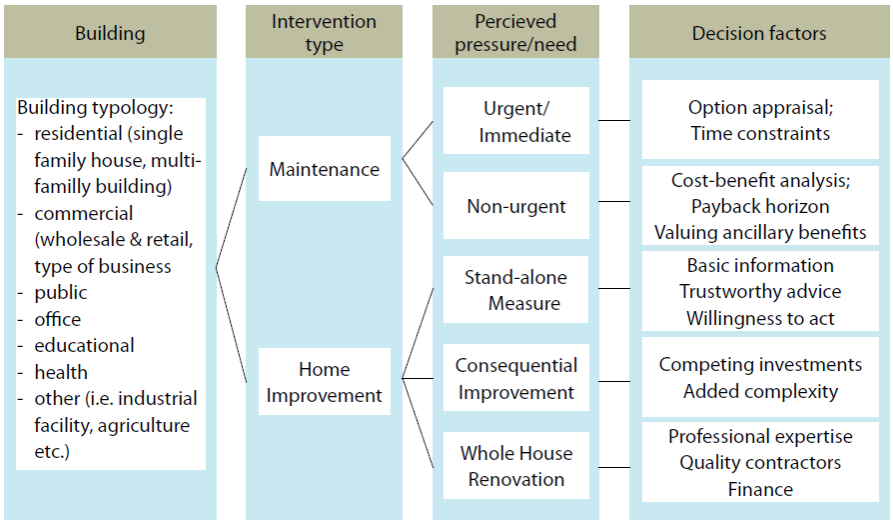


Figure 11 Building owner decision making process

Marketing and outreach efforts should be multi-layered and multi-faceted, targeting audiences by whom they are, where they live, and the events going on in their lives. Public outreach should be aimed at target audiences through both mainstream and multicultural media. The advertising should also spill over onto audiences in specific geographic areas. An overarching layer of mainstream marketing and advertising should be aimed at three audiences:

- **"Early Adopters":** Those who are strong environmentalists, already poised to "do the right thing" for the environment and who just need to hear about the Campaign and rebates.
- **"Retrofit-Ready":** Those who are already planning home improvements and just need a little more information about what steps to take to save money and "do the right thing" for the environment.
- **"Retrofit-Persuadable":** Those who are thinking about their utility bills, home comfort, and the

[14] http://www.europeanclimate.org/documents/LR_%20CbC_study.pdf

environment or our dependence on fossil fuels/foreign oil, and who need information about what types of improvements they could make and what steps to take to save energy, money and reduce fossil fuel consumption.

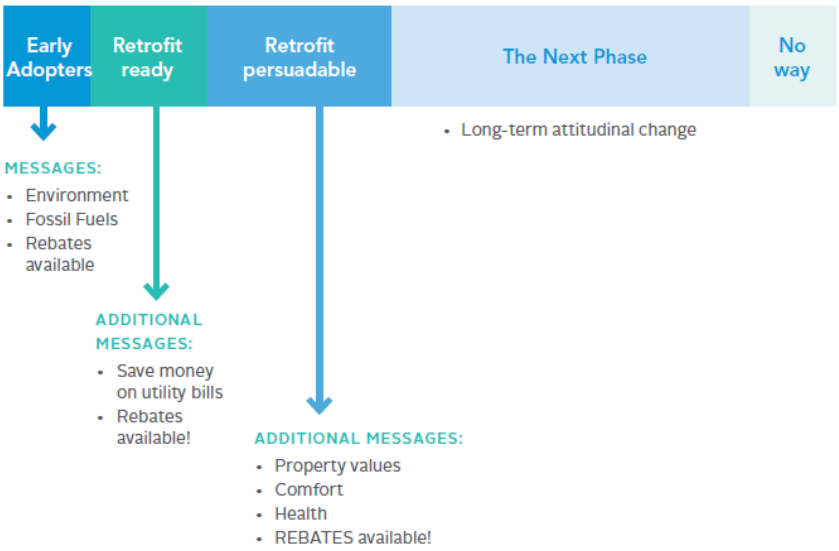


Figure 12 Audience types

Similar audience segmentations have been noted in other campaigns, as illustrated in the figure below.

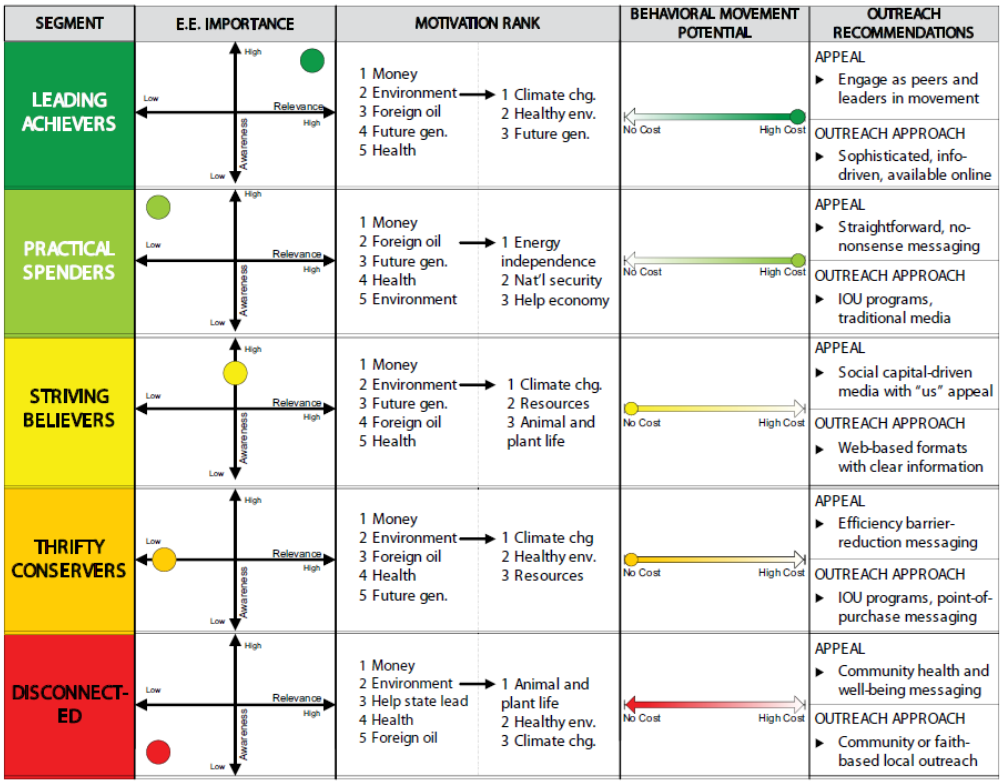


Figure 13 Further example of audience segmentation

Marketing should focus on each target audience, providing impressions close to their homes and reaching out to mass audiences, as shown in the "target" figure below.

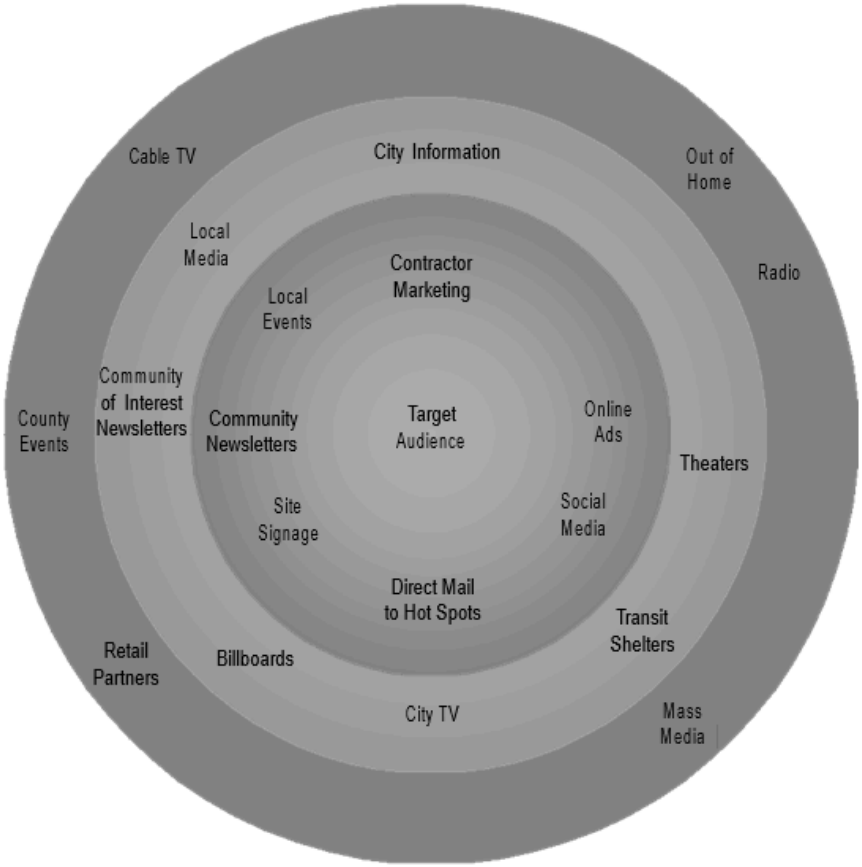


Figure 14 Audience targeting

5.2.1. Market analysis

A detailed market analysis to support specific parts of the outreach and communications strategy should be conducted, which should start by identifying the location of audiences that are receptive to specific outreach strategies. The market analysis should be conducted using consumer market research combined with demographic data and property characteristics data from national housing, demographics and statistics compilers. The main output from the analysis is to identify areas with a high proportion of target properties, and which are ideal areas for targeted marketing. These maps can be used for an energy retrofit or upgrade, or contractor marketing strategies. Pilot marketing Campaigns in those areas should test the extent community-based marketing positively impacts participation rates. To determine where to create intense marketing Pilot Campaigns, it is recommended to use characteristics based on statistically significant market research to determine potential areas where high percentages of relevant audiences live. Characteristics could include:

- High percentage of houses built before the 1980s
- High percentage of homeownership
- High energy usage
- Demographics:
  - Income over Euro 40,000 to Euro 80,000

- High percentage of college-educated
- High percentage of population age 35-50
- High percentage of households with 4+ people

Additional considerations could include:

- A cluster of homes that is small enough to enable the campaign to reach the majority of residences and generate word-of-mouth activity, yet large enough to offer a good sized pool of people with a propensity to be interested in an energy upgrade.
- Strong neighbourhood and community organizations that can be engaged as partners, as well as existing communication vehicles (municipal, mainstream and multicultural).
- "Spill over" opportunities possibly offered to nearby neighbourhoods that also have a high percentage of the target audiences.

Consequently a typical market analysis scenario could be as follows:

MARKET ANALYSIS SCENARIO	AUDIENCE IDENTIFIED	DATA ANALYZED	RELATED MARKETING STRATEGY
1. Early adopters/ retrofit ready	Environmentalists, ready to take action now with information about rebates	Demographic criteria, Property characteristics	Pilot Marketing areas
2. Retrofit persuadable	Those who need information about types of improvements, with emphasis on rebates and cost savings	Demographic criteria, Property characteristics	Pilot Marketing areas
3a. Built environment Heating and cooling	Middle-aged to newer homes located inland that are larger and often have high a/c, heating bills	Property characteristics, location of Home	Trigger event Marketing: utility Bills, Pilot area Marketing
3b. Built environment-Heating	Smaller, older coastal homes that may have comfort issues in winter	Property characteristics, location of Home	Trigger event Marketing: comfort, Pilot Marketing areas
4. Multi-family	Multi-family homeowners	Demographic criteria, Property characteristics	Multi-family Marketing, Pilot Marketing areas
5. Whole neighbourhood	Tracts of similarly-aged and built homes	Property characteristics, location of Home	Whole neighbourhood Marketing, Pilot Marketing areas

Table 7 Example of a market analysis scenario

5.3. Marketing Approaches

Based on the market research above, the following pilot marketing areas should be developed at launch and then phased in during the market out-reach project. Marketing and outreach could also include:

5.3.1. City-wide Marketing

This strategy is entirely research-driven, focusing on those property owners most likely to undertake a home energy upgrade. Outreach should be aimed at target audiences through both mainstream and multicultural media. The advertising should also spill over onto audiences in specific geographic areas, providing additional impressions to those who are also targeted in the Pilot Marketing Areas. This should also add to the cities' efforts to promote the Campaign, as their residents should also see the City-wide marketing efforts. Marketing should focus on each target audience, providing impressions close to their home and reaching out to more mass audiences. Tactics can include:

TACTIC	DESCRIPTION	PAID/EARNED	LEAD
television			
	ad buys on Broadcast TV, google, etc	Paid	Campaign Manager
	"this old House" segment on whole house performance and rebates while renovating house (filming in la this summer)	earned	Campaign Manager
	coverage on mainstream and multicultural stations	earned	Utilities/ Campaign
	"infomercial" and promos on city TV	Placed	Campaign Manager
radio			
	commute time spots	Paid	Campaign Manager
	PSAs on mainstream stations	Placed	Utilities/ Campaign Manager
	spots on multicultural stations	Paid	Campaign Manager
print			
	coverage in mainstream and multicultural papers	earned	Utilities / Campaign Manager
	magazine green homes section	earned	Campaign Manager
	ads in Local newspaper real estate sections	Paid	Utilities/ Campaign
	ads in multicultural papers	Paid	Campaign

	Direct Mail to targets	Paid	Utilities
social media			
	Blogs (about homes, environment, bargains)	earned	Campaign
	Facebook page	Placed	Campaign
	Ads targeted to interest in environment and/ or home improvements (this old House, etc.)	Paid	Campaign Manager
	Google adWords targeted to interest in environment and/or home improvements	Paid	Campaign Manager
	Twitter, both by the Campaign me and by individual early adopters (with incentives)	Placed	Campaign Manager
	Youtube, early adopters make a video about their experience and results (with incentives)	Placed	Campaign Manager
out of Home			
	Retail kiosks, banners, flyers, links on retail websites	Placed	Utilities
community/ organizations			
	Environmental groups and others, newsletters, websites, email blasts	earned	Campaign Manager
	Home improvement shows booths	Paid	Campaign Manager
	City-wide events	Paid	Utilities
	Blogger/subject matter events	Paid	Campaign Manager

Table 8 Example of tactics for city-wide marketing

5.3.2. Intense Grassroots Community Outreach

Attempts should be made to contact 10-12 community-based organizations, faith-based organizations, homeowner associations, neighbourhood associations, and community leaders in each area. The campaign should provide these organizations with training and tools to become ambassadors for the Campaign and spread the word throughout their communities.

5.3.3. Saturation Marketing

Investor-owned utilities (IOUs) should send direct mail to homeowners. The Campaign Manager should contact local papers for news placement and ads, social media, and potentially outdoor (bus shelters and sides and street level signage) to increase impressions that drive people to the website.

5.3.4. Pilot Marketing Areas

The Campaign Manager should intensify marketing efforts in specific pilot marketing areas where high percentages of the Early Adopter and Retrofit Ready audiences live.

TACTIC	DESCRIPTION	PAID/ EARNED	LEAD
radio			
	PSAs on multicultural stations	earned	Campaign Manager
print			
	coverage in local papers	earned	Campaign Manager
	ads in local and multicultural papers	Paid	Campaign Manager
outdoor			
	Bus shelters in area	Paid	Campaign Manager
	On street lamppost signage	Paid	Campaign Manager
	Billboards	Paid	Campaign Manager
social media			
	Blogs (relevant to the area)	earned	Campaign Manager
	Online ads targeted by location	Paid	Campaign Manager
	List serves of neighbourhood associations (through cities)	earned	Campaign Manager
out of Home			
	Movie theatre ads in area	Paid	Campaign Manager
	Lawn signs on homes in area (through contractors)	Paid	Campaign Manager
community/ organizations			
	Community meetings with incentives to organizations for participation	earned/Paid	Campaign Manager
	Community events	Paid	Campaign Manager
	Door hangers	Paid	Campaign Manager

Table 9 Example of tactics for pilot marketing

5.3.5. Trigger event marketing

This suite of strategies should be aimed at capturing energy efficiency opportunities from multiple trigger events. Participants should mainly come through contractors, realtors and retail partners; property owners should have also seen city-wide advertising. Trigger events include:

- Replacing old or non-functioning HVAC systems and water heaters.
- Remodelling for life-stage changes (growing family) or just to renew the house.
- Improvements made when purchasing or selling a house.
- Complaints about high energy bills or a cold/hot house.

EVENT	DESCRIPTION	LEAD	AGENT	COLLATERAL / TACTIC
1. Replace on burnout (heating, air conditioners, water heaters)	Homeowners either in process of replacing an item or have already done some efficiency projects	Campaign Manager	• Retail partners • HVAC installers • General contractors	• Materials for contractors/ installers • Retail displays
2. Life-stage changes (growing family)	Homeowners working with a contractor	Campaign Manager	• General contractors	• Materials for contractors • ads in media for home remodels
3. Home remodel	Homeowners working with an architect, contractor	Campaign Manager	• Contractors • Architects	• Materials for contractors • ads in media for home remodels
3. Improvements at time of purchase	Homeowners interested are preparing a new home for move-in (research shows more interest at purchase than at sale)	shared	• Contractors • Realtors • Home inspectors • city permit offices • City welcome kits • Retail	• Brochures for cities • ads in weekend homes for sale sections • Presentations to realtor groups • Retail displays
4. Improvements at sale	House owners preparing for sale	Campaign Manager	• Contractors • Realtors	• Materials for contractors

5. Complaints: high utility bills, cold/ hot house	Homeowners aware of energy-saving improvements but not whole house approach	Campaign Manager	• Contractors	• Materials for contractors

Table 10 Example of tactics for trigger event marketing

5.3.6. City outreach

Outreach by cities should be critical because of their existing relationships with local constituencies. Cities should be provided with a mini-marketing plan, talking points, videos, customizable templates of fact sheets, articles for their newsletters and advertising materials so they can develop low-cost out-reach to their residents. Cities with communities targeted in the Pilot Area Marketing plans should be informed and encouraged to do out- reach to those areas. All Cities should be encouraged to:

- Run stories in print and online newsletters.
- Send information to neighbourhood associations, homeowners associations, historic preservation districts, and other appropriate community organizations.
- Provide information in City permitting offices and City Hall lobbies.
- Provide information at strategically located Environmental Information Centres and at CITY office locations.
- Provide information in "new homeowners" welcome kits (either directly from the city or through title companies/ mortgage brokers).

Cities will be encouraged to do the following:

- Run stories in print and online news- letters
- Send information to neighbourhood associations, homeowners associations, historic preservation districts, and other appropriate community organizations
- Provide information in City permitting offices and City Hall lobbies
- Provide information at strategically located Environmental Information Centres and at city office locations
- Provide information in "new home- owners" welcome kits (either directly from the city or through title companies/mortgage brokers)
- Run videos and spots on City TV stations

5.3.7. Contractor marketing

Certified general contractors (where and when applicable) should be listed on the Campaign website, sending many leads directly to them. They also have access to the "heat maps" to use for developing their own advertising campaigns. Contractors should be attending orientation sessions to ensure they thoroughly understand the rebates, financing options and can help guide their customers through the process. They should be provided with Contractor Marketing Kits to ensure they have key messages at hand that have been resonating with homeowners and have information to give to potential customers

who may or may not have visited the website. Kits can be sent directly to contractors or distributed at the orientation sessions. Kits should contain:

- Talking points
- DVD of the video
- Printed fact sheets to leave with customers (with room for their contact info)
- Printed brochures about the Multi-Family Outreach whole house approach
- Printed in-depth brochure
- CD with "button" to link to campaign from their own websites

Contractors should have access to a separate section of the website where they should be able to order additional customizable materials "on-demand," find information about Campaign events, promotions and advertising, any changes to the Campaign , and a single trade contractor database for assembling teams for customers who would like solar panels or new windows, for example. For the purposes of the Campaign, contractors are divided into particular segments based on the type of service provided. An initial analysis of the industry revealed the following likely categories:

- Home Performance (HP) Contractors
- Production Builders
- HVAC System/Specialty Trades (windows, etc.)
- Remodelling Contractors
- Solar Contractors

CONTRACTOR TYPE	TRIGGER EVENT	VALUE TO	BUSINESS MODEL
Home Performance	Upgrade	Lead generation	scale for high volume
Production Builder		New Business Development	create new division
HVAC	Replacement	Lead generation; Value-add	expand services
Specialty trade		Lead generation	partner with certified product/service
Retrofitter	Retrofit, life-stage transition	Value-add	sub work to HP contractor
Solar	Renewables	Lead generation	Partner with certified gc

Table 11 Example of tactics for contractor marketing

5.3.8. Retail partner marketing

Utilities should partner with the major retail outlets in the country providing them with:

- Information centres
- Campaign collateral
- Table tents
- Window clings

Property owners should find information about opportunities for retrofitting, low-income rate subsidies, green jobs training and other initiatives available to qualified lower income households.

5.4. Description of marketing / communication tools

Information presented to the occupant must be presented in a way that is understandable. The inability to present information successfully is a major setback to effective knowledge transfer which should on the other hand present clear information with no confusion.

Information to be presented to the Occupant group must be:

Open: - The information should not be restricted to only certain groups of occupants but must be accessible to all interested parties. The dissemination medium should also provide the opportunity for feedback and participation from the occupants.

Accessible: - The information source must be easily accessible and provide information that is easily understandable to the user. This means everyone must be able to consult and understand the information, regardless of the technology they use or any disabilities they may have.

Correct: - Delivering factual and correct information with regards to installation methods, performance characteristics, etc. is a very important aspect of knowledge transfer. All information provided must be balanced and impartial allowing the occupant to be the best judge of the EE retrofitting technologies available on the market.

Up to date: - The technical information provided in the communication must relate to technology that is possible to implement at the time of communication and not something that is still in its design stages. Furthermore, the information must be updated as per the latest technological developments.

Suitable: - It should contain just the right amount of technical information to enable the not so technically conversant occupant to understand the advantages of the retrofitting technology while also intriguing the technically competent person. The information provided should include detailed actual examples of implemented technologies in other buildings with real data of the energy savings experienced. Furthermore, when possible, it is recommended to provide hands-on opportunities for the occupant to experience the results of the retrofitting intervention, e.g. through visits to demonstration projects.

Marketing and outreach city-wide efforts should include:

- **Direct Mail.** Utilities should place messages on outer bill envelopes sent to customers. They intend to send direct mail about the campaign to "target areas" based on a combination of energy usage, age of home and household income.
- **Campaign Manager Events.** Utilities should attend large events occurring in the vicinity, with a

whole house scheme that includes a mini model house that visitors can "tour." There are additional proposed events that utilities, the Campaign Manager or cities should attend.

- **Social Media.** The Campaign should heavily use social media to reach target audiences while minimizing cost, beginning at launch and continuing throughout the Campaign.
- **City-wide Incentives.** Several concepts are being developed, including incentives for energy assessments and contractors.
- **City-wide Media Buys.** With a fixed launch date, media buys should be spread to avoid specific events happening concurrently like elections. Buys can include mainstream broadcast television. Social media buys include Google AdWords (in English and other relevant languages) and blog ads. Print buys include in-language publications.

Home Energy Makeover Contest. Home Energy Makeover Contests generate a tremendous amount of publicity and have been successfully conducted in many other states and cities. The concept is to model the behaviour the Campaign is trying to encourage by showing a "whole house approach," how easy upgrades can be, how much the rebates can reduce overall project cost, and how much difference upgrades can make to a home. Contests can be conducted.

- **Media Relations.** The Campaign should coordinate Campaign Manager, utility, and City efforts. Media relations should be in three phases: pre-launch, launch and milestones.

The following section discusses a bit further the best approach for social media, which is a pretty recent concept in marketing, and merits further clarifications.

5.4.1. Placed/Earned Social Media

A campaign should have a component for social media to push information to target audiences, increase perceptions of the Campaign as being community-based, reach those who will help generate additional buzz/independent marketing efforts about the Campaign, and provide a mechanism for listening to what people are saying about it - and responding when necessary.

Online Paid Advertising

Online advertising campaigns can be very cost- effective and highly targeted by demographics, areas of interest, and geographics. Ads appear on topic-related blogs, on search engine pages (e.g. Google) and on content pages (e.g., when you search for information about a related topic and select a website to view):

- **Types of Users:** Target ads by age, gender, income, language preference, postal code, or hot spots
- **Types of Searches:** Target ads by type of search conducted, based on key words

Ads are usually sold per "click" - the viewer has clicked on the ad and been sent to the Campaign website. The Campaign can make four types of online ad purchases, namely:

1. Google ads that place ads both on its search pages and on hundreds of websites, targeted by the above
2. Networks that target specific sites and blogs that match the target audiences
3. Directly through select publishers online
4. Online editions of local papers in pilot marketing areas

Twitter

Twitter users are mostly college graduates that have attended graduate school. Users are three times more likely to follow brands and companies on Twitter than other users of social networks, with 40% specifically using Twitter to learn about and provide opinions on brands.

Twitter can push the latest developments and news to people who have expressed an interested in the Campaign (they must sign up to receive Tweets or have searched for tag words included in Tweets.) It's also an easy way for those who follow the Campaign on Twitter to share Tweets with their friends, thereby generating buzz and helping market the Campaign. Twitter can share Campaign news in real time; drive people to the website, facilitate early adopters/buzz makers, reach younger homeowners and increase marketing efforts at a low cost. Twitter can be effectively used to communicate the Campaign and its milestones in a variety of ways:

- Tweet about press releases, major announcements, new items on website or blogs, media stories, and articles; especially about those that are time sensitive and tell our audience what is happening with the Campaign and encourages them to participate or find out more.
- Put a Tweet icon on the main website, allowing visitors to the website to begin to follow the Campaign on Twitter with one click.
- Follow others who Tweet about the Campaign, as well as those who Tweet about related topics. This will provide an opportunity to directly respond to a person who has a question about the Campaign, and point them to a link to the website.

Setting up a Twitter account is free, as is using an application such as TweetDeck that helps follow others who are Tweeting about the Campaign. The only significant cost is staff time, which can be limited to a few hours a week.

Facebook

Facebook is a low-cost and easy way of both marketing the Campaign and supporting an online community of people interested in the Campaign. It will reach audiences who are more likely to spend time on Facebook versus a web- site, and who may prefer to receive short, real time Campaign news

via Facebook rather than emails or websites. It is ideal for posting links to videos and photos related to the project. It complements the website; a place where fans of the Campaign can find information, ask questions and share ideas and excitement. These fans will generate buzz by telling their friends about the Campaign through Facebook. A Facebook page will contain information about the Campaign, a link to the website, Campaign news, videos, photographs, and other information. When the page is updated, fans will receive links in email alerting them to the new posts. Facebook is also ideal for sharing the story of an early adopter (who will also Tweet) through updates, photographs and videos. It lends itself much more naturally to this people-focused approach than a website, which is more formal. Additional points:

- Encourage and perhaps reward Campaign adopters to share their experiences, ask questions, etc.
- Set up controls to determine what content Fans can post to the wall
- Monitor updates to the wall and take down inappropriate content
- Respond to issues, questions, and take part in the conversation
- A designated staff person should monitor the site; it is also ideal if several staff members post content, and if partners are active participants, although the overall strategy should be centralized

Relatively few direct costs; staff time will fluctuate during busy/calm periods, with high activity at the beginning as the Campaign kicks off and a fan base is established. Ongoing staff time needed to keep page fresh with 3-4 posts/ week, daily maintenance required to monitor postings from fans.

Blogs

Blogs reach target audiences who are already interested in related topics and who have high potential to participate in the Campaign to further marketing efforts.

- Identify bloggers who will likely write positively about the Campaign. Send press release, fact sheets, and Campaign information to bloggers who write about topics such as the environment, energy efficiency, home improvement/remodelling, real estate/housing, bargains/saving money, as well as to companies that sell solar panels, contractors, etc.
- Bloggers are looking for topical stories to write about, and Campaign publications will make their next blog post easy. Because these campaigns are typically high reward/optional Campaigns, bloggers will write favourably and help tell the story in a friendly, accessible and easy-to-under- stand way (although you don't have control over what they write). People who are dissatisfied will write negative comments, but it is advisable to monitor blogs and actively correct misperceptions.

YouTube

Post all videos related to the project on YouTube. The campaign will work with media partners to develop a contest for early adopters to film their experience and let website visitors vote on the best. Winner receives a prize to be determined.

5.5. DESCRIPTION OF KEY MESSAGES

The following messages had the highest resonance in polling and focus groups both in Los Angeles Campaign Manager and the Bay Area.

5.5.1. Primary Motivators

The following two messages about saving money were essential to motivating all target audiences. They should be part of every piece of advertising or collateral produced.

1. **Rebates.** Homeowners who make energy- saving home improvements may qualify for incentives or tax credits/rebates depending on the Member State regulations, and how much they reduce energy consumption.
2. **Save on Utility Bills.** Upgrading a home to use less energy and water can reduce utility bills by 20% or more—saving you money over time.

5.5.2. Secondary Motivators

The following messages are then layered, de- pending on which audience is being targeted.

- **Help the Environment/Climate Change.** We all need to do our part to help the environment and slow climate change. Making our homes more green and energy efficient is an important step we should all take.
- **Reduce Foreign Oil/Fossil Fuels.** At a time when we are trying to reduce our dependence on foreign oil and other fossil fuels, upgrading the energy efficiency of our homes is an important step we can all take. (In focus groups the concept of energy independence further resonated as independence from utility companies; getting off the grid).
- **Certified Contractors Save Money.** Specially trained and certified contractors know how to find improvements that the average homeowner would not. Their assessments will ensure that you find more energy savings and, therefore, save more money on your utility bills. Additional motivator: Contractors are certified by the country certification body.
- **Increase Property Values.** Homes that are energy-efficient and environmentally friendly are more appealing to homebuyers. These upgrades can increase your property value.
- **Comfort.** Upgrading your home's energy efficiency - in particular upgrading insulation - can make it a more comfortable place to live. Eliminate draughty, cold rooms in the winter

or hot, stuffy rooms in the summer.

- **Indoor Air Quality.** Insulation and ventilation can reduce allergy and asthma- causing mould and mildew, improving indoor air quality, especially for infants and those with health conditions.

5.6. EVALUATION

The primary goals of the marketing plan are to build positive awareness of retrofitting and create a sustained market for a whole house approach. Objectives are specific to those achieving those goals. City residents should see multiple iterations of media coverage, paid advertising, in-store displays, contractor marketing and in-person presentations (in the pilot marketing areas). This should spur them to action - but if they already had plans to remodel or had previously worked with a contractor, they might call their contractor and thus actually come to the Campaign through the contractor. Therefore it should not be easy to determine precisely what has motivated each person to participate in Energy Upgrade.

To monitor, the campaign should include a short survey as part of the marketing process, asking participants what drew them to the website/organisation, and to the Campaign. The website should ideally be able to monitor click-throughs to contractors' sites from the Campaign website, providing an indication of potential participant online metrics who came to the site.

6. CONCLUSIONS

EE retrofitting for the establishment of EE buildings is an important aspect of building technology in that it supports all three pillars of economic development - specifically economic growth, social progress, and environmental improvement. EE Retrofitting interventions can power economic development by enabling industry and commerce in the retrofitting market; it can stimulate social progress by catalysing the building industry, R&D and education; and it can promote environmental improvement by reducing on the energy consumption of existing buildings.

This deliverable aims to propose strategies and ideas that would bring the EE retrofitting knowledge and techniques closer to the building owners/occupants by promoting market up-take among society. Knowledge transfer in the retrofitting value chain is essential in order to sustain a healthy value chain and provide the necessary impetus for knowledge generation and use in the market.

APPENDIX 1 – BIBLIOGRAPHY

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APPENDIX 2 – GLOSSARY

Definitions Related to Energy

Aerothermal energy is the energy stored in the form of heat in the ambient air (EPBD 2009).

Biofuels are liquid or gaseous fuel for transport produced from biomass (EPBD 2009).

Bioliquids are liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass (EPBD 2009).

Biomass is the biodegradable fraction of products, waste and residues from biological origin from agr iculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste (EPBD 2009).

Carbon dioxide emissions measured in kilograms of CO_2 per square meter ($kgCO_2/m^2/year$) annual use of energy in specific terms, such as the number of kilowatt hours used per square meter ($kWh/m^2/y$ ear).

Carbon dioxide equivalent (CO_{2eqv}) computing the amount of CO_2 that would have the same effects as other greenhouse gas emissions, such as methane (ASTM E2725-10).

Carbon footprint is emissions associated with the use of power, transport, food and other consumption f or an individual, family or organization are added up to give one comparable measure in units of carb on dioxide equivalent (ASTM E2725-10). The impact of human activities in terms of the amount of gree nhouse gases they produce.

Cogeneration is simultaneous generation in one process of thermal energy and electrical and/or mecha nical energy (EPBD 2010).

Combined heat and power is the simultaneous conversion of primary fuels into mechanical or electrical and thermal energy, meeting certain quality criteria of energy efficiency (EPBD 2002).

Cost-optimal level is the energy performance level which leads to the lowest cost during the estimated economic lifecycle, where:

(a) the lowest cost is determined taking into account energy-related investment costs, maintenance and operating costs (including energy costs and savings, the category of building concerned, earnings from energy produced), where applicable, and disposal costs, where applicable; and

(b) the estimated economic lifecycle is determined by each Member State. It refers to the remaining esti mated economic lifecycle of a building where energy performance requirements are set for the buildin g as a whole, or to the estimated economic lifecycle of a building element where energy performance r equirements are set for building elements (www.epbd-ca.eu).

Distribution system operator means a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applic able, its interconnections with other systems and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity (EPBD 2006, 2009).

District heating/district cooling is the distribution of thermal energy in the form of steam, hot water or chilled liquids, from a central source of production through a network to multiple buildings or sites, for th e use of space or process heating or cooling (EPBD 2009).

Effective rated output (expressed in kW) is the maximum calorific output specified and guaranteed by the manufacturer as being deliverable during continuous operation while complying with the useful effic iency indicated by the manufacturer (EPBD 2002, 2010).

Efficient district heating and cooling' means a district heating or cooling system using at least 50 % re newable energy, 50 % waste heat, 75 % cogenerated heat or 50 % of a combination of such energy and heat (EPBD 2012).

Efficient heating and cooling' means a heating and cooling option that, compared to a baseline scenar io reflecting a business-as-usual situation, measurably reduces the input of primary energy needed to su pply one unit of delivered energy within a relevant system boundary in a cost-effective way, as assess ed in the cost-benefit analysis referred to in this Directive, taking into account the energy required for e xtraction, conversion, transport and distribution (EPBD 2012).

Efficient individual heating and cooling' means an individual heating and cooling supply option that, c ompared to efficient district heating and cooling, measurably reduces the input of non-renewable prim ary energy needed to supply one unit of delivered energy within a relevant system boundary or requir es the same input of non-renewable primary energy but at a lower cost, taking into account the energy required for extraction, conversion, transport and distribution (EPBD 2012).

Embodied Energy is defined as the energy used during the entire life cycle of a product including the e nergy used for manufacturing, transporting, and disposing of the product. Embodied energy, as related to life cycle assessment (LCA), is a useful tool for evaluating the relative environmental impact of variou s building materials because it takes production, transportation and disposal into account, all things that can have a pronounced environmental impact but are not necessarily reflected in the price.

Due to the complexity of calculations and the wide range of production methods, transportation distanc es and other variables for some building products, exact figures for embodied energy vary from study to study. Fortunately, precise figures are not necessary. Builders, designers, purchasers and others can make informed decisions based on the embodied energy of a given product relative to its substitutes. It should be noted that when considering the embodied energy of an entire building, the energy embodie d in the building materials is small relative to the energy it takes to operate that building over its lifetim e. Looking at the embodied energy of a typical building, for example, only 15% of that energy is emb odied in the materials used to make the building; the other 85% is in the operation of the building over its lifetime (Lippke et. al., 2004; buildingsdatabook.eren.doe.gov).

Another definition by ASTM E2114 (2008) is the energy used through the life cycle of a material or pr oduct to extract, refine, process, fabricate, transport, install, commission, utilize, maintain, remove, and u ltimately recycle or dispose of the substances comprising the item.

Energy; all forms of commercially available energy, including electricity, natural gas (including liquefie d natural gas), liquefied petroleum gas, any fuel for heating and cooling (including district heating and cooling), coal and lignite, peat, transport fuels (excluding aviation and maritime bunker fuels) and biom ass as defined in Directive 2001/77/EC of the European Parliament and of the Council of 27 Septemb er 2001 on the promotion of electricity produced from renewable energy sources in the internal electric ity market (EPBD 2006);

Energy audit means a systematic procedure with the purpose of obtaining adequate knowledge of the existing energy consumption profile of a building or group of buildings, an industrial or commercial ope ration or installation or a private or public service, identifying and quantifying cost-effective energy sa vings opportunities, and reporting the findings (EPBD 2012).

Energy conservation means performing less work, using less light, heat, and movement (ASTM E2725-1 0).

Energy distributor means a natural or legal person, including a distribution system operator, responsibl e for transporting energy with a view to its delivery to final customers or to distribution stations that sell energy to final customers (EPBD 2006, 2012).

Energy consumption in buildings; heating and cooling are the main energy consumers in buildings and account for approximately 35%-40% of a building's total energy consumption. However in some buildi ngs, most of this energy is wasted due to inadequate insulation. In most cases well-proven energy effici ency techniques, can be cut 70 to 90% of a building's energy need for heating or cooling (http://ec.eu ropa.eu).

Energy efficiency means the ratio of output of performance, service, goods or energy, to input of ener gy (EPBD 2012).

Energy efficiency is also defined as reducing energy consumption without causing any diminution in livin g standards and service quality in buildings as well as in the product quality and amount in the industri al sector (Yıldız, Y., MENR, 2007).

Energy efficiency improvement means an increase in energy efficiency as a result of technological, be havioural and/or economic changes (EPBD 2012).

Energy from renewable sources are the energy from renewable non-fossil sources, namely wind, sola r, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewag e treatment plant gas and biogases (EPBD 2009, 2010).

Energy intensity is the amount of primary energy consumed per gross national income (Haydaroğlu, 20 06). "At the national level, energy intensity is the ratio of total domestic primary energy consumption or final energy consumption to gross domestic product or physical output". If the energy intensity is less in a country, a product can be produced with less energy. It means that energy efficiency is achievable as well (Yıldız, Y. 2008).

Energy management system means a set of interrelated or interacting elements of a plan which sets a n energy efficiency objective and a strategy to achieve that objective (EPBD 2012).

Energy performance contracting means a contractual arrangement between the beneficiary and the p rovider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments (work, supply or service) in that measure are paid for in relation to a co ntractually agreed level of energy efficiency improvement or other agreed energy performance criteri on, such as financial savings (EPBD 2012).

Energy savings means an amount of saved energy determined by measuring and/or estimating consu mption before and after implementation of an energy efficiency improvement measure, whilst ensuring normalisation for external conditions that affect energy consumption (EPBD 2012).

Energy service means the physical benefit, utility or good derived from a combination of energy with e nergy-efficient technology or with action, which may include the operations, maintenance and control ne cessary to deliver the service, which is delivered on the basis of a contract and in normal circumstances has proven to result in verifiable and measurable or estimable energy efficiency improvement or prima ry energy savings (EPBD 2012).

Energy service provider means a natural or legal person who delivers energy services or other energy efficiency improvement measures in a final customer's facility or premises (EPBD 2012).

Energy service company (ESCO) is a natural or legal person that delivers energy services and/or othe r energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on th e achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria (EPBD 2006).

Final energy consumption means all energy supplied to industry, transport, households, services and a griculture. It excludes deliveries to the energy transformation sector and the energy industries themselv es (EPBD 2012).

Financial instruments for energy savings are all financial instruments such as funds, subsidies, tax reb ates, loans, third-party financing, energy performance contracting, guarantee of energy savings contra cts, energy outsourcing and other related contracts that are made available to the market place by pu blic or private bodies in order to cover partly or totally the initial project cost for implementing energy efficiency improvement measures (EPBD 2006).

Final customer means a natural or legal person who purchases energy for own end use (EPBD 2012).

Geothermal energy is the energy stored in the form of heat beneath the surface of solid earth (EPBD 2 009).

Greenhouse gases (GHGs) are vaporous constituents of the Earth's atmosphere, both natural and anthr opogenic, that absorb and emit radiation at specific wavelengths, including carbon dioxide, methane, ni trous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (ASTM E2725-10).

Greenhouse gas source is a physical unit or process that releases a GHG into the atmosphere (ASTM E 2725-10).

Heat pump is a device or installation that extracts heat at low temperature from air, water or earth an d supplies the heat to the building (EPBD 2002, 2010).

Hydrothermal energy is the energy stored in the form of heat in surface water (EPBD 2009).

Life-cycle is consecutive and interlinked stages of a product system, from raw material acquisition or ge neration from natural resources to final disposal in environmental impact management (ISO 14040).

Life cycle analysis (assessment) LCA is a technique for assessing the potential environmental aspects and potential aspects associated with a product (or service), by:

- compiling an inventory of relevant inputs and outputs,
- evaluating the potential environmental impacts associated with those inputs and outputs,

- interpreting the results of the inventory and impact phases in relation to the objectives of the stu dy (www.gdrc.org).

Life-cycle cost (LCC) method is a technique of economic evaluation that sums over a given study period the costs of initial investment (less resale value), replacements, operations (including energy use), and m aintenance and repair of an investment decision (expressed in present or annual value terms) (ASTM E2 114-08).

DISCUSSION—LCC method is distinct from LCA in that LCA is an environmental review methodology an d LCC method is an economic review methodology.

Overall efficiency means the annual sum of electricity and mechanical energy production and useful he at output divided by the fuel input used for heat produced in a cogeneration process and gross electrici ty and mechanical energy production (EPBD 2012).

Primary energy is the energy from renewable and non- renewable sources which has not undergone an y conversion or transformation process (EPBD 2010).

Primary energy consumption' means gross inland consumption, excluding non-energy uses (EPBD 2012).

Public bodies means the State, regional or local authorities, bodies governed by public law, associatio ns formed by one or several of such authorities or one or several of such bodies governed by public la w (EPBD 2012).

Retail energy sales company means a natural or legal person who sells energy to final customers (EPB D 2012).

Small and medium-sized enterprises (SMEs) means enterprises as defined in Title I of the Annex to Co mmission Recommendation 2003/361/EC of 6 May 2003;

1. The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which e mploy fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/ or an annual balance sheet total not exceeding EUR 43 million.

2. Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 5 0 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 millio n.

3. Within the SME category, a microenterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million E PBD (2003).

Smart metering system (Intelligent metering system) means an electronic system that can measure en ergy consumption, providing more information than a conventional meter, and can transmit and receive data using a form of electronic communication (EPBD 2012).

Solar thermal energy uses sun to heat water or air. There are also so called "high temperature" solar c ells that produce electricity by steam turbines. The thermal solar cell is a very simple technique that cons ists of implementing the greenhouse effect in boxes exposed to the sun (Figure 1-3).

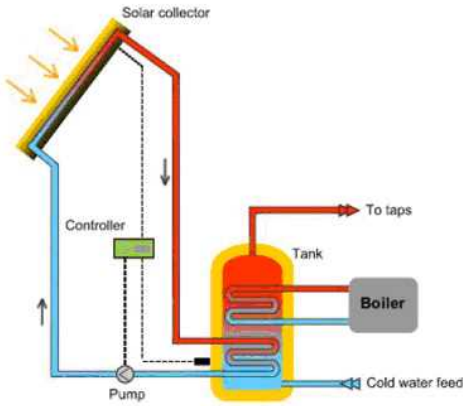

Figure 15 Solar thermal energy system for heating water (www.pres.org.pk).

Figure 16 Solar panel (www.pres.org.pk).

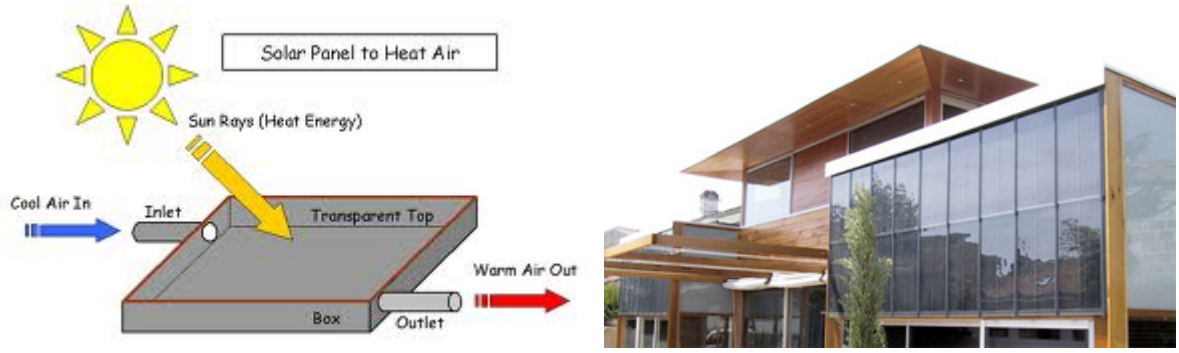

Figure 17 Solar thermal energy for heating air (www.makeitsolar.com)

Thermal bridge; is important for heat loss. If thermal performance is improved in one area with the ad dition of insulation, while an adjacent area is not insulated, a local cold spot – known as a thermal brid ge or cold bridge – is created (English Heritage).

Thermal loss is an inter-medium/body transfer of thermal energy, causes a decrease in heat from hott er medium/body to colder medium/body. Thermal loss can occur either in one, two or three dimensions.

In almost all situations, loss occurs in three dimensions but in order to facilitate the calculations/measure ments it is assumed that occurs in one dimension.

Thermal Flow can be either transient or steady process. While in transient-state thermal flow is time de pendent, in steady-state the flow proceeds until the thermally interconnected (either in physical connecti on-state or in range of radiative influence) system reaches the equilibrium state.

There are three main types of mechanisms which can be either act alone or in combinations:

- Conduction requires a direct molecular connection,
- Convection requires a fluid (liquid or gas) medium to transfer heat,
- Radiation requires a line of sight connection between the surfaces involved to transfer the energy by means of electromagnetic waves through gas or vacuum (www.buildingscience.com).

Thermal mass is the ability of a material to absorb heat energy. It is equivalent to thermal capacitanc e or heat capacity, the ability of a body to store thermal energy. A lot of heat energy is required to ch ange the temperature of high density materials like concrete, bricks and tiles. They are therefore said t o have high thermal mass. Lightweight materials such as timber have low thermal mass. Correct use of th ermal mass moderate internal temperatures by averaging day/night (diurnal) extremes. This increases comfort and reduces energy costs.

Poor use of thermal mass can exacerbate the worst extremes of the climate and can be a huge energy and comfort liability. It can radiate heat all night during a summer heat wave, or absorb all the heat y ou produce on a winter night. To be effective, thermal mass must be integrated with sound passive desi gn techniques. This means having appropriate areas of glazing facing appropriate directions with appr opriate levels of shading, insulation and thermal mass (www.yourhome.gov.au).

Total energy consumption

Total energy consumption of different sectors in EU (2012) is shown in Figure 4.

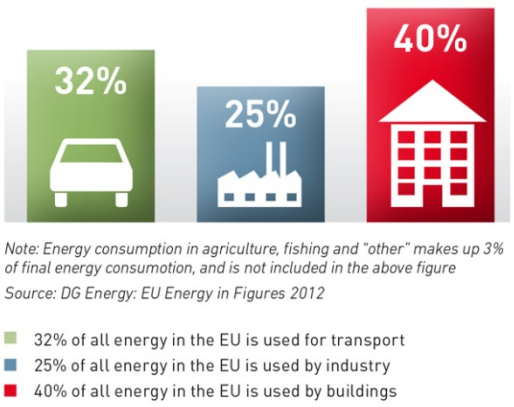

Figure 18 Total energy consumption distribution to sectors in EU (DG Energy, 2012)

Transmission system operator means a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applic able, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity (EPBD 2009).

Definitions Related to Retrofitting of Buildings

3-litre-house; calculated primary energy consumption for heating and ventilation, using the national cal culation standard, corresponding to maximum 3 litres of oil per m^2 (~34 kWh/m^2yr primary energy co nsumption) (Erhorn, H. and Erhorn-Kluttig, H., 2011).

Air-conditioning system is a combination of all components required to provide a form of air treatmen t in which temperature is controlled or can be lowered, possibly in combination with the control of ventil ation, humidity and air cleanliness (EPBD 2002, 2010).

Air-tightness is the resistance of the building envelope to inward or outward air leakage. Excessive air leakage results in increased energy consumption and a draughty, cold building (http://hrsservices.co.uk) .

Air leakage is the uncontrolled flow of air through gaps and cracks in the building envelope (sometimes referred to as infiltration or draughts). This is not to be confused with ventilation, which is the controlled flow of air into and out of the building through purpose built ventilators that is required for the comfort and safety of the occupants (New4Old WP4.1, 2009).

Air permeability measurement is an assessment of building envelope air leakage. This involves establi shing a pressure differential across the envelope and measuring the air flow required to achieve that di fferential. This is normally achieved by utilising variable flow portable fans which are temporarily instal led in a doorway, or other suitable external opening (http://hrsservices.co.uk).

Bioclimatic house; bioclimatic architecture refers to the design of buildings and spaces (interior – exter ior – outdoor) based on local climate, aimed at providing thermal and visual comfort, making use of sol ar energy and other environmental sources. Basic elements of bioclimatic design are passive solar syste ms which are incorporated into buildings and utilise environmental sources (for example, sun, air, wind, vegetation, water, soil, sky) for heating, cooling and lighting the buildings.

Bioclimatic design takes into account the local climate and includes the following principles:

- Heat protection of the buildings,
- Use of solar energy for heating buildings,
- Protection of the buildings from the summer sun,
- Using passive cooling systems and techniques, such as natural ventilation, mostly during night tim e,
- Improvement – adjustment of environmental conditions in the interiors of buildings, i.e. increasin g the air movement inside spaces, heat storage, or cool storage in walls,
- Ensuring insulation combined with solar control for day-lighting of buildings,
- Improvement of the microclimate around buildings.

Boiler is the combined boiler body and burner-unit designed to transmit to water the heat released fro m combustion (EPBD 2002, 2010).

BREEAM certificate is a standard for best practice in sustainable building design, construction and oper ation and has become one of the most comprehensive and widely recognised measures of a building's e nvironmental performance.

A BREEAM assessment uses recognised measures of performance, which are set against established ben chmarks, to evaluate a building's specification, design, construction and use. The measures used represe nt a broad range of categories and criteria from energy to ecology. They include aspects related to en ergy and water use, the internal environment (health and well-being), pollution, transport, materials, wa ste, ecology and management processes (www.breeam.org).

Building is a roofed construction having walls, for which energy is used to condition the indoor climate; a building may refer to the building as a whole or parts thereof that have been designed or altered to be used separately (EPBD 2002, 2010).

Building envelope are the integrated elements of a building which separate its interior from the outdo or environment (EPBD 2010). (Figure 5).

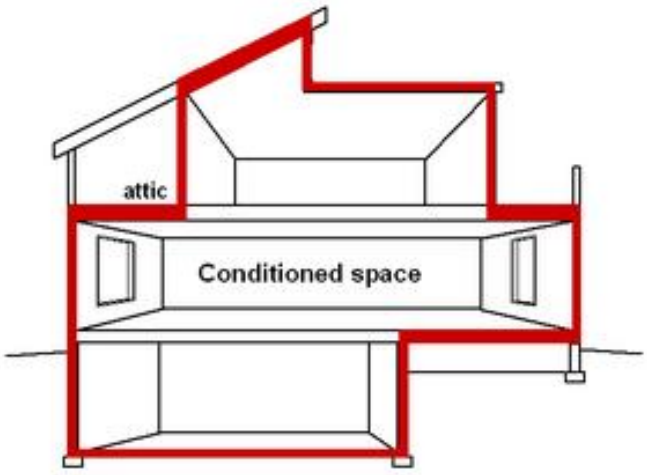

Figure 19 The building envelope (www.resourcecenter.pnl.gov)

Building element is a technical building system or an element of the building envelope (EPBD 2010).

Building occupant one who has certain rights to, possession of, or control over the premises occupied, s uch as tenant or owner (ASTM E1480-92).

Building unit is a section, floor or apartment within a building which is designed or altered to be used s eparately (EPBD 2010).

Climate active house is the standard consisting of four main areas:

- planning and realisation,
- energy and accommodation,
- construction materials and construction,
- health and comfort.

Each area contains between 8 and 24 sub-items which are awarded with a certain amount of defined points. Similar definitions that include energy as well as other types of items have been or are currently

developed in many EU Member States, such as BREEAM2 in the UK or DGNB3 in Germany (Erhorn, AN DErhorn-Kluttig, AND2011).

Diagnostics tests are home energy assessment procedures which include a visual inspection and instrum ented diagnostic testing procedure. They help detecting construction, equipment, and air distribution sys tem installation and design flaws frequently missed by visual inspection alone (e.g., air leaks, bypasses, chase ways, duct leakage, carbon monoxide leakage, system back drafting). These tests include a blow er door air infiltration test, pressure diagnostics test, and heating and cooling system inspection (Wendt, R.L., 1996).

Double-skin facade is a system of building consisting of two skins placed in such a way that air flows in the intermediate cavity (Figure 6). The ventilation of the cavity can be natural, fan supported or mecha nical. Apart from the type of the ventilation inside the cavity, the origin and destination of the air can di ffer depending mostly on climatic conditions, the use, the location, the occupational hours of the building and the HVAC strategy.

The glass skins can be single or double glazing units with a distance from 20 cm up to 2 metres. Often, for protection and heat extraction reasons during the cooling period, solar shading devices are placed inside the cavity (Compagno, A., 1999).

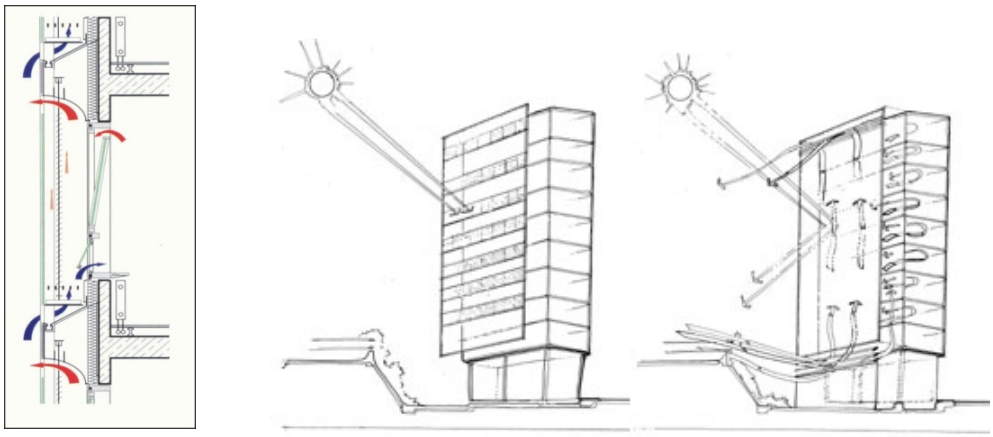

Figure 20 Double-skin facade (www.theislingtonestate.com, Compagno, A., 1999)

Eco-building is defined by the European Commission (www.ecobuildings.info) as "meeting point of short -term development demonstration in order to support legislative and regulatory measures for energy e fficiency and enhanced use of renewable energy solutions within the building sector, which go beyond t he Directive on the Energy Performance of Buildings. Double approach: to reduce substantially, and, if possible, to avoid the demand for heating, cooling and lighting, and to supply the necessary heating, c ooling and lighting in the most efficient way and based, as far as possible, on renewable energy sourc es and polygeneration (Erhorn,H.,Erhorn-Kluttig,H.,2011).

Energy efficiency improvement is an increase in energy end-use efficiency as a result of technological, behavioural and/or economic changes (EPBD 2006).

Energy efficiency improvement measures are all actions that normally lead to verifiable and measur able or estimable energy efficiency improvement (EPBD 2006).

Energy efficiency improvement programmes are activities that focus on groups of final customers and that normally lead to verifiable and measurable or estimable energy efficiency improvement (EPBD 20 06).

Energy efficiency mechanisms are general instruments used by governments or government bodies to create a supportive framework or incentives for market actors to provide and purchase energy services and other energy efficiency improvement measures (EPBD 2006).

Energy performance certificate of a building is a certificate recognised by the Member State or a leg al person designated by it, which includes the energy performance of a building calculated according t o a methodology based on the general framework set out in the Annex of (EPBD 2002, 2010).

Energy performance certification provides a means of rating individual buildings – whether they be re sidential, commercial or public – on how efficient (or inefficient) they are in relation to the amount of en ergy needed to provide users with expected degrees of comfort and functionality. The degree of effici ency depends on many factors including: local climate; the design of the building; construction methods and materials; systems installed to provide heating, ventilation, air condition or hot sanitary water; and the appliances and equipment needed to support the functions of the building and its users.

Clearly, certification is a complex procedure, requiring in-depth knowledge of building components. It a lso reflects increasing recognition of the need to think of buildings as "integrated systems", rather than s imply the sum of their parts.

Energy certification of buildings typically involves three main steps: (IEA, 2010)

- The assessment of the energy performance of a building by a competent assessor using a nomi nated methodology.
- The issuance of a certificate rating the building's energy performance which includes, in some c ases, information on possible improvements likely to yield energy savings.
- The communication of this information to stakeholders through publication of the certificate.

For existing buildings, energy certification attests to the energy performance of the building, and provi des information that may increase demand for more efficient buildings, thereby helping to improve the energy efficiency of the building stock.

Energy performance of a building is the amount of energy actually consumed or estimated to meet the different needs associated with a standardised use of the building, which may include, inter alia, heatin g, hot water heating, cooling, ventilation and lighting. This amount shall be reflected in one or more num eric indicators which have been calculated, taking into account insulation, technical and installation char acteristics, design and positioning in relation to climatic aspects, solar exposure and influence of neighb ouring structures, own-energy generation and other factors, including indoor climate, that influence the energy demand (EPBD 2002, 2010).

Energy self-sufficient house; a truly energy efficient house is a self-sufficient house. Working toward s elf-sufficiency is the way to go toward achieving personal power and freedom.

- Self sufficient & energy efficient home plans include...
- Home solar power systems,
- Wind generated power,
- Thermal mass and passive solar home design,

- Energy efficient building materials,
- Rainwater harvesting and storage
- Energy efficient home appliances such as, energy efficient washers and dryers, water heaters, r efrigerators, energy efficient windows, and lighting.
- An affordable design,

Energy efficient home design involves two things - finding ways to do things without using energy, and u sing the least amount of energy to do things that require it (www.gaia-back-to-the-garden.com).

Green building (Green construction-Sustainable building) refers to a structure and using process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from siting to de sign, construction, operation, maintenance, renovation, and demolition. This requires close cooperation of the design team, the architects, the engineers, and the client at all project stages (Ji, Y and Plainiotis, S. , 2006). The Green Building practice expands and complements the classical building design concerns o f economy, utility, durability, and comfort (U.S. Environmental Protection Agency, 2009).

Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that the green buildings are designed to reduce the overall i mpact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources,
- Protecting occupant health and improving employee productivity,
- Reducing waste, pollution and environmental degradation (U.S. Environmental Protection Agenc y, 2009).

Green roof (Eco-roof) is a planted roof top that provides benefits of water harvesting, storm water ma nagement, energy conservation, pollution reduction and aesthetic value. Green roofs vary in depth of g rowing media, types of plants (climate-dependent), infrastructure, and intended use (http://buildgreen. ufl.edu).

Green roofs benefit the environment and local communities in many ways:

- They filter the air and water,
- They produce oxygen, absorb heat (during evapotranspiration) and absorb carbon dioxide,
- They provide shade which helps to minimize the impact of the urban heat island effect and red uces the building's air conditioning requirements, which in turn reduces the greenhouse gas emiss ions from burning fossil fuels for cooling,
- They absorb rainwater which reduces storm water runoff,
- They provide habitat for urban wildlife,
- They provide leisure and recreational space for building occupants and the local community,
- They insulate the building against external sound,
- They can be used to grow local produce,
- They protect existing roofing, which reduces the number of replacements required and roofing waste,

The basic structure of a green roof is as follows:

- Conventional structural support,

- Waterproof roofing membrane,
- Root repellent system,
- Drainage system,
- Filtering layer,
- Growing medium,
- Plants (www.ecolife.com).

Heat cost allocators are the devices that enable to measure total heat consumption by measuring the c onsumption of each individual radiator.

Heat flow density (q) is defined as the heat loss per unit area of an external member, can be calculat ed as:

$$q = U(\theta_i - \theta_e)$$

where; θ_i: interior temperature and θ_e: exterior temperature

Heat gain of buildings

Heat gain of buildings may occur in two different ways (Figure 7); (spineciudad.net)

Solar radiation gains

Solar radiation is introduced into the building through the transparent surface of the building (glazing a nd walls with a transparent insulation). The amount of sunshine gains depends on the orientation of trans lucent surfaces and their sizes. Maximum gains of sunshine are expected in the southern areas, less in th e east and west ones. For the calculation of solar gains, in addition to the orientation and thermal chara cteristics of transparent surfaces, it should be taken into account any shading, angle of sunlight and dirt on the windows.

Internal resources gains

Internal sources gains are the result of the release of heat in using electrical appliances and other buildi ng equipment. Even people release heat in the surrounding, that is why it is always necessary to take int o account the number of fixed users of the appliances, on the calculation. Every person emits heat aroun d 100 W (depending on his physical activity). The quantity of heat generated in the functioning of elect rical devices, is often dependent on the number of users. Also regarding the artificial illumination, each l amp emits heat flux (40W, 60W, 100W). Part of the internal gains is reduced on account of evaporati on (25W/person) and cold water (5W/person).

Heat loss from buildings

Building loses heat in two ways: with the transmission (passage of heat through the building envelope) a nd ventilation (ventilation losses) (Figure 7).

Transmission heat losses

Transmission heat losses are losses due to heat transfer through the building element as a result of its th ermal conductivity. Transmission heat losses are indicated through heat transfer (U) expressed in W/m^2

K and line heat transfer (Ø - thermal bridges) in W/mK. Transmission losses are reduced by increasing i nsulation and decreasing thermal bridges.

Ventilation losses

Ventilation heat losses are losses due to exchange air between the building and the surrounding area. T hose can be like intentional ventilation (ventilation through windows, mechanical ventilation) or unintende d and unwanted ventilation (ventilation through joints, cracks, etc...). Air-tight windows and building env elop reduce ventilation losses, but at the same time they disable the supply quantity of fresh air into the building. Therefore, the passive house as well the very good low-energy buildings requires the installati on of mechanical ventilation systems with efficient heat recovery.

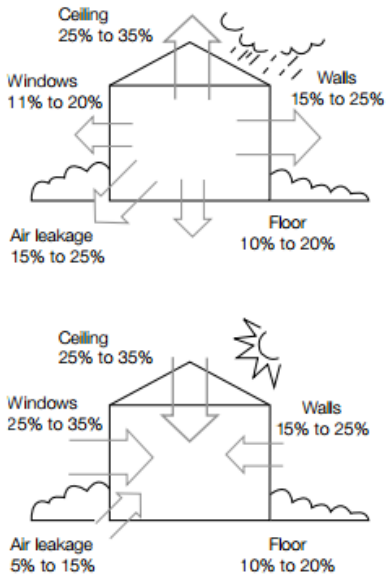

Figure 21 Typical Heat Gains and Losses in a Temperate Climate (www.buildwise.org)

Heat recovery ventilation (HRV) is an energy recovery ventilation system using equipment known as a heat recovery ventilator, heat exchanger, air exchanger, or air-to-air heat exchanger which employs a counter-flow heat exchanger (counter-current heat exchange) between the inbound and outbound air fl ow (www.healthyhouseinstitute.com). HRV provides fresh air and improved climate control, while also sa ving energy by reducing heating (and cooling) requirements. Energy recovery ventilators (ERVs) are clo sely related, however, ERVs also transfer the humidity level of the exhaust air to the intake air (Figure 8).

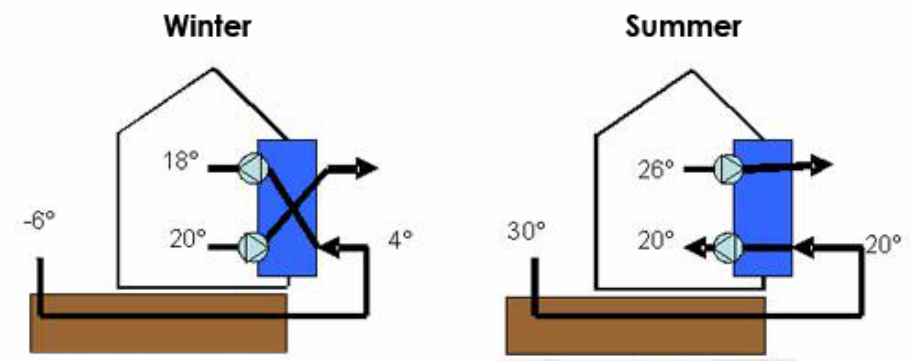

Figure 22 Energy Recovery ventilation (www.concept-bio.eu)

HVAC (Heating, Ventilation and Air-Conditioning) systems are designed to maintain good indoor air quality through adequate ventilation with filtration and provide thermal comfort. The choice of HVAC is important for energy efficiency.

Indoor air quality is the composition and characteristics of the air in an enclosed space that affect the o ccupants of that space (ASTM E2114-08).

Infrared photography (or thermo graphic photography) is often used to assess energy performance. It can determine where heat is being lost from the building envelope and can show small differences in te mperature. (Figure 9). In the photograph, the red and yellow areas show the heat losses from the buildi ng where the blue and green areas show the parts that have good thermal characteristic.

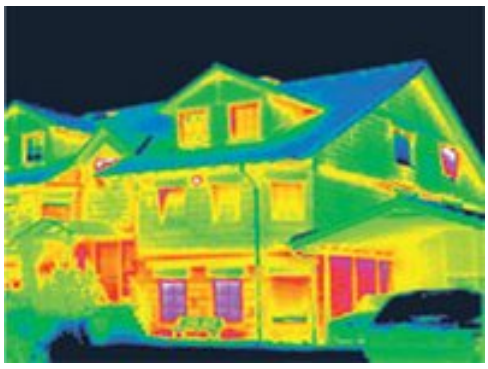

Figure 23 An IR thermal photography example (English Heritage, 2010; www.thermalsurveys.com

Insulation materials may either be organic materials derived from animals and plants or organic synth etic materials derived from oil or inorganic mineral based materials (Smith, P.F., 2004). The choice of th e material for insulation purposes depends on various factors:

- Insulation efficiency (λ values),
- Life of the material (resistance to deterioration by chemicals, moisture changes and fire),
- Human-health friendliness,
- Economy.

While choosing the best material from EE perspective, the preference should be given to the ones that a re produced with lower energy, e.g. recycled materials, organic materials, etc…

LEED certificate provides independent, third-party verification that a building project meets the highest green building and performance measures. All certified projects receive a LEED plaque, which is the nat ionally recognized symbol demonstrating that a building is environmentally responsible, profitable and a healthy place to live and work. There are both environmental and financial benefits to earning LEED c ertification.

LEED-certified buildings:

- Lower operating costs and increased asset value,
- Reduce waste sent to landfills,
- Conserve energy and water,
- Healthier and safer for occupants,
- Reduce harmful greenhouse gas emissions,
- Qualify for tax rebates, zoning allowances and other incentives in hundreds of cities,
- Demonstrate an owner's commitment to environmental stewardship and social responsibility (lee d-certificate.com).

Light tubes also called sun/solar pipes, solar light, or tubular skylights, are tubes/pipes used for transp ort and/or distribution of natural light to another location. A light tube uses highly reflective material or plastic optical fiber to lead the light rays through a building. It can also be a prism light guide distributi ng light uniformly over its length (Figure 10-11).

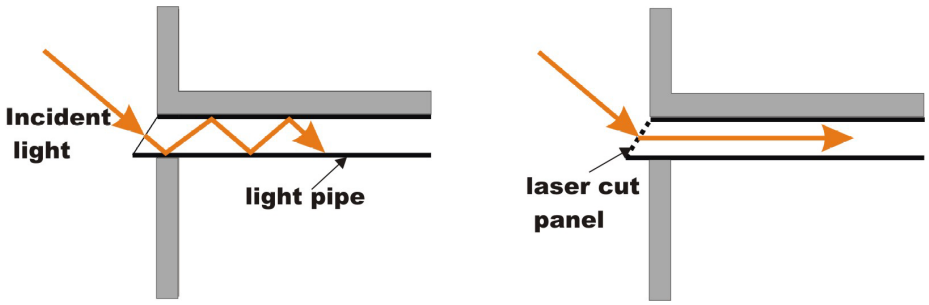

Figure 24 Left: Light pipe with clear glazing.

Light at any high angle coming into the pipe will be lost due to multiple reflections. Right: Light pipe wit h LCP. LCP redirects the light along the pipe reducing the number of reflections and therefore loss of int ensity.

Figure 25 Solar light pipe (www.greendiary.com)

Low energy house is understood in most countries as a building with a calculated energy consumption t hat is significantly lower than the national requirements. This can be regarded as an informal definition, and was -and still is applied differently in different countries, sometimes even within the same country (Erhorn, H. and Erhorn-Kluttig, H., 2011).

Major renovation of a building can be explained as where:

(a) the total cost of the renovation relating to the building envelope or the technical building systems is higher than 25 % of the value of the building, excluding the value of the land upon which the building i s situated; or

(b) more than 25 % of the surface of the building envelope undergoes renovation (EPBD 2010).

Mixed-use building is a building with different utilization purposes reserved for different areas of the building, for example, a commercial or residential building with shops on the ground floor, office space s on the first floor and flats on the upper floor (EPBD, 2011).

Natural ventilation is the use of wind and temperature differences to create airflows in and through bu ildings. These airflows may be used both for ventilation air and for passive cooling strategies. Natural ventilation is often strongly preferred by building occupants, especially if they have some control over i t, as with operable windows. Studies have shown that most occupants will readily tolerate a wider rang e of ambient conditions if they have such control (www1.eere.energy.gov).

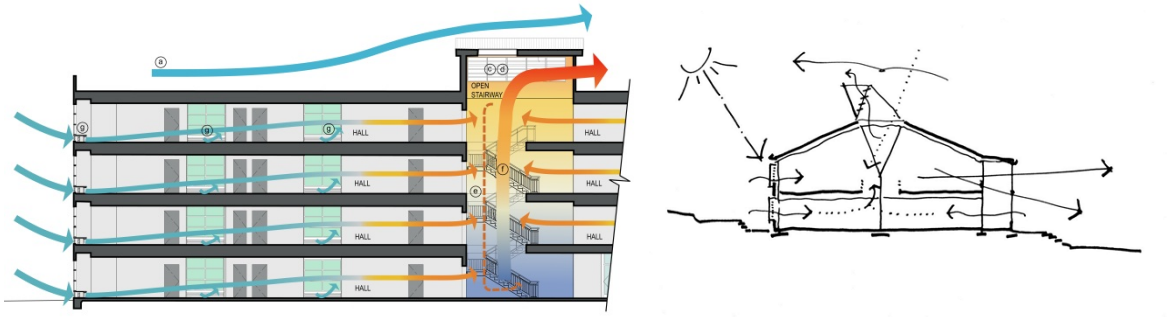

Figure 26 Natural ventilation (www.mognot.com)

Nearly zero-energy buildings is a building that has a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from r enewable sources, including energy from renewable sources produced on-site or nearby.

The recast EPBD (2010), in article 9, requests that the Member States shall ensure that:

a) by 31 December 2020, all new buildings are nearly zero-energy buildings; and

b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero energy buildings.

Member States shall draw up national plans for increasing the number of nearly zero-energy buildings.

Therefore, according to article 9, the Member States must have in their national plans a detailed applic ation in practice of the definition of nearly zero-energy buildings, reflecting their national, regional or l ocal conditions, and including a numerical indicator of primary energy use, expressed in kWh/m² per y ear. The national plans shall also include intermediate targets for improving the energy performance of new buildings by 2015, with a view to preparing the implementation of nearly zero-energy buildings.

In the period 2011 – 2015, the Concerted Action EPBD foresees a core theme dedicated to the topic N early zero-energy buildings. Within this core theme, the national approaches for applying the definitio n will be gathered and discussed. Plans for policies and support initiatives will be compared, and ideas for such will be exchanged between national representatives.

Night ventilation (Cooling) is the use of the cold night air to cool down the structure of a building so th at it can absorb heat gains in the daytime This reduces the daytime temperature rise. It is usually appli ed to buildings that are not occupied at night, although an occupied building would probably be ventil ated anyway.

Night ventilation can be driven by natural forces – i.e. stack or wind, but may use auxiliary fan power, either to provide sufficient airflow at times when the natural forces are weak, or to allow smaller ducts (causing greater resistance) to be used (www.architecture.com).

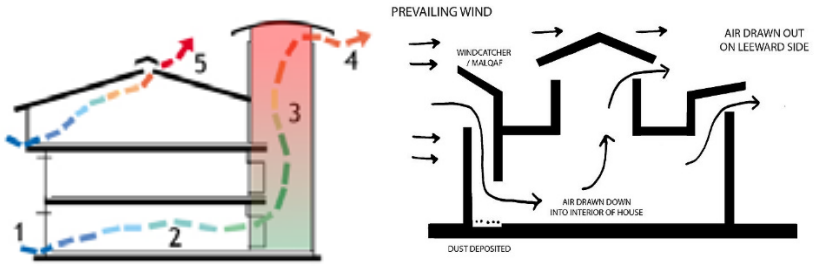

Figure 27 Solar chimney stack-induced cross ventilation (Inland Revenue Centre, (www.cooneyarch itects.blogspot)

Occupancy profile/patterns: The results of the retrofit program will improve if installation personnel an d housing occupants understand why energy efficiency is important. It is also of importance that the occ upancy profile is well-evaluated by education can help improve occupant comfort by promoting the pr oper use of energy-efficient appliances and equipment (Wendt, R.L., 1996).

Passive house: An example of a high performance building term with a rather exact quantitative defin ition is the passive house. Several countries (Austria, Germany, Czech Republic and Denmark) use the sa me definition, which was developed by a private organisation for the German building market:

- Maximum calculated net energy use for heating: 15 kWh/m²year,
- Maximum total calculated primary energy consumption: 120 kWh/m²a,
- Required air-tightness value: n50 ≤ 0.6 1/h (Erhorn, H. and Erhorn-Kluttig, H. 2011).

Passive house refers to standard for energy efficiency in a building, reducing its ecological footprint. P assive design is not an attachment or supplement to architectural design, but a design process that is int

egrated with architectural design. Although it is mostly applied to new buildings, it has also been used f or refurbishments (Zeller, Jr. T., 2010 ; Ji Y., Plainiotis, S., 2006).

Passive Solar Heat Gain: In passive solar building design, windows, walls, and floors are made to colle ct, store, and distribute solar energy in the form of heat in the winter and reject solar heat in the summe r. This is called passive solar design or climatic design because, unlike active solar heating systems, it do esn't involve the use of mechanical and electrical devices (Figure 14) (Doerr, T., 2012).

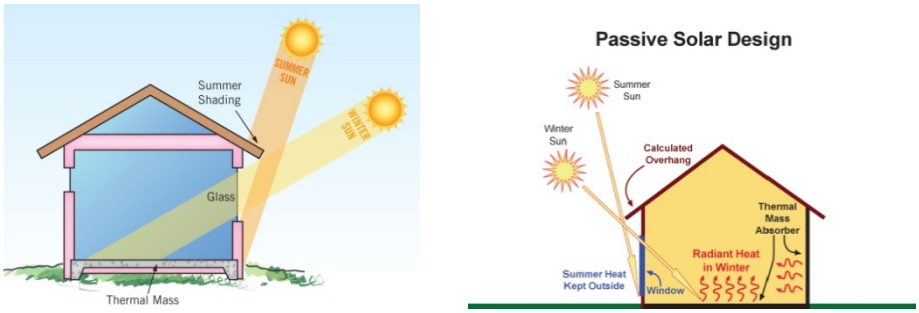

Figure 28 Passive solar design (Wikipedia.org)

Passive solar heating is one of several design approaches collectively called passive solar design. Wh en combined properly, these strategies can contribute to the heating, cooling, and day-lighting of nearl y any building. The types of buildings that benefit from the application of passive solar heating; range from barracks to large maintenance facilities.

Typically, passive solar heating involves:

- The collection of solar energy through properly-oriented, south-facing windows
- The storage of this energy in "thermal mass," comprised of building materials with high heat ca pacity such as concrete slabs, brick walls, or tile floors
- The natural distribution of the stored solar energy back to the living space, when required, thro ugh the mechanisms of natural convection and radiation
- Window specifications to allow higher solar heat gain coefficient in south glazing.

Passive solar heating systems do not have a high initial cost or long-term payback period, both of which are common with many active solar heating systems. Increased user comfort is another benefit to passiv e solar heating. If properly designed, passive solar buildings are bright and sunny and in tune with the nuances of climate and nature. As a result, there are fewer fluctuations in temperature, resulting in a hig her degree of temperature stability and thermal comfort. By providing a delightful place to live and w ork, passive solar buildings can contribute to increased satisfaction and user productivity. In addition, p assive solar design does not generate greenhouse gases and slows fossil fuel depletion (www.wbdg.org).

Payback period is the length of time required to recover the cost of an investment. The payback period of a given investment or project is an important determinant of whether to undertake the position or pro ject, as longer payback periods are typically not desirable for investment positions. Calculated as (ww w.investopedia.com):

Payback Period = Cost of Project / Annual Cash Inflows

Photovoltaic systems offer consumers the ability to generate electricity in a clean, quiet and reliable way. Photovoltaic systems are comprised of photovoltaic cells, devices that convert light energy directly into electricity (Figure 15-17). Because the source of light is usually the sun, they are often called solar c ells. The word photovoltaic comes from "photo," meaning light, and "voltaic," which refers to producing electricity. Therefore, the photovoltaic process is "producing electricity directly from sunlight." Photovolt aics are often referred to as PV. PV cells convert sunlight directly into electricity without creating any ai r or water pollution. PV cells are made of at least two layers of semiconductor material. One layer has a positive charge, the other negative. When light enters the cell, some of the photons from the light are absorbed by the semiconductor atoms, freeing electrons from the cell's negative layer to flow through a n external circuit and back into the positive layer. This flow of electrons produces electric current. There are three types of photovoltaic cells:

- Polycrystalline cells,
- Monocrystalline silicon cells,
- Amorphous cells (www.concept-bio.eu).

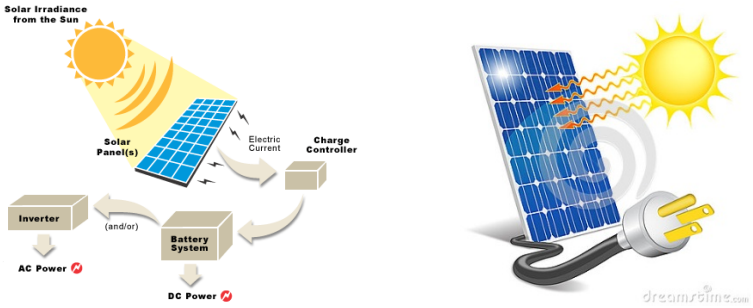

Figure 29 Photovoltaic System (ewbprincetonsierraleone.wordpress.com, www.sustainableguernsey.info)

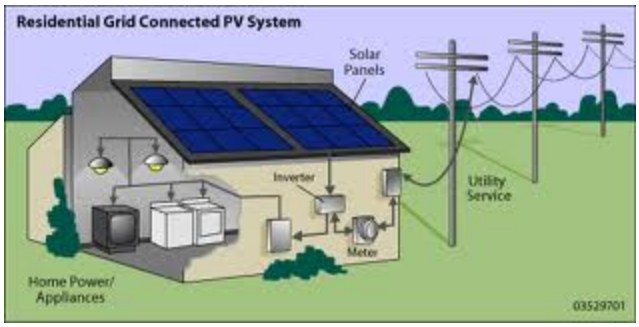

Figure 30 PV System (www.infinitepower.org)

Figure 31 PV panels integrated in buildingsenvelope (www.concept-bio.eu).

Panels covered with cells based on silicon that are exposed to the solar radiation to produce electricity. The produced electricity can feed a single site or be put back into to the general distribution network.

Plus-energy house produces more energy from renewable energy sources, over the course of a year, t han it imports from external sources. This is achieved using a combination of microgeneration technology and low-energy building techniques, such as: passive solar building design, insulation and careful site se lection and placement. A reduction of modern conveniences can also contribute to energy savings, howe ver many energy-plus houses are almost indistinguishable from a traditional home, preferring instead to use highly energy-efficient appliances, fixtures, etc., throughout the house (en.wikipedia.org).

Precooling/Preheating

Pre-heating coil used to warm up the air entering the supply ducted system to a predefined value (e.g.; not controlled according to indoor temperature)

Pre-cooling coil used to cool down the air entering the supply ducted system to a predefined value (CE N/TC 156)

Shading devices; Exterior shading devices such as overhangs and vertical fins have a number of advan tages that contribute to a more sustainable building. First, exterior shading devices result in energy savi ngs by reducing direct solar gain through windows. By using exterior shading devices with less expensiv e glazing, it is sometimes possible to obtain performance equivalent to unshaded higher performance gl azing. A second benefit is that peak electricity demand is also reduced by exterior shading devices res ulting in lower peak demand charges from utilities and reduced mechanical equipment costs. Finally, ext erior shading devices have the ability to reduce glare in an interior space without the need to lower sh ades or close blinds. This means that daylight and view are not diminished by dark tinted glazing or bl ocked by interior shades. With exterior shading devices, glare control does not depend on user operati on (Carmody, J., Haglund, K., 2006).

External shading devices are a passive design strategy to control solar heat gain in buildings, and influ ences energy performance. It can reduce solar heat gain more effectively than interior devices, and its efficiency depends on the provided shading (Olgyay and Olgyay, 1957; ASHRAE, 2001). In hot climat es, the use of shading devices is desirable, intercepting the unwanted solar rays of overheating period. These elements influence heat gain, especially in relation to location and orientation (Gutierrez, G.C.R., Labaki, L.C., 2007).

Smart home system (SHS) is an approach to building automation, which may include the centralized co ntrol of lighting, HVAC, appliance and other systems, by means of computer and information technolog

y to provide improved energy efficiency, security, comfort and convenience (Harper et al.,2003; Gerha rt, 1999).

Solar chimney can be used to improve natural ventilation in buildings by encouraging the convection of air upwards. A solar chimney can assist natural ventilation, particularly in regions with high solar irradia tion and low wind speeds (Figure 18-19). Heat recovery can be used in the chimney to collect energy f or heating domestic hot water, or stored in a Thermal-bank for use in a cold season (www.icax.co.uk).

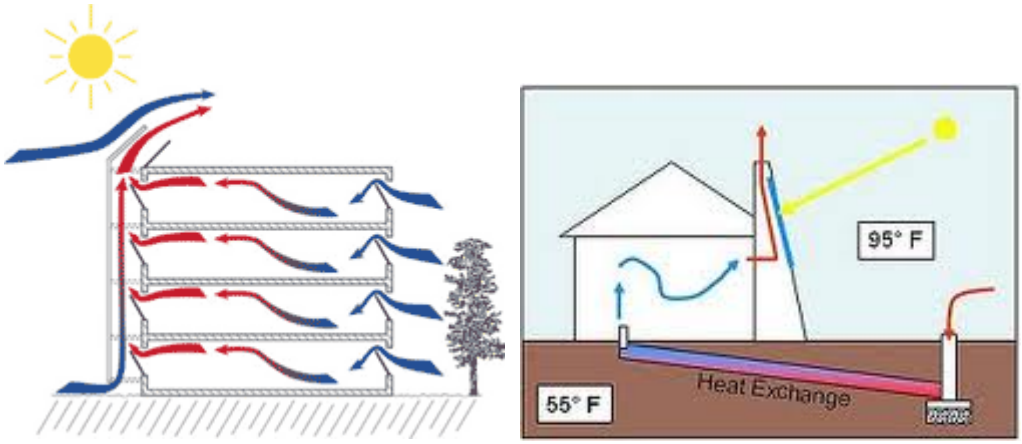

Figure 32 Solar Chimney (passivesolar.weebly.com)

Figure 33 BRE building (www.projects.bre.co.uk).

Solar cooling technologies are mainly classified into two main groups depending on the energy supply : a thermal/work driven system and electricity (Photovoltaic) driven system. The solar-powered cooling system generally comprises three main parts: the solar energy conversion equipment, the refrigeration s ystem, and the cooled object (e.g. a cooling box). (www.erc.uct.ac.za)

Solar radiation is radiant energy emitted by the sun, particularly electromagnetic energy.

Solar Wall utilizes the free solar energy from the sun to heat air for the building ventilation system. This is non-polluting and uses renewable energy. The wall is incorporated in the building structure utilizing th e air space between the Solar Wall and the structures interior building. That air space is heated by the Sun's rays then drawn into the building to heat the occupied spaces (Figure 20).

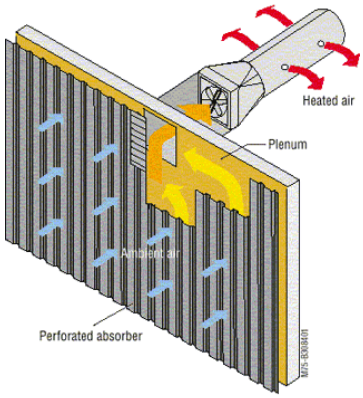

Figure 34 Working Principle and Application of Solar Wall (www.solar-designs-inc.com, www.solarwall.com)

Technical building system is the technical equipment for the heating, cooling, ventilation, hot water, lighting or for a combination thereof, of a building or building unit (EPBD 2010).

Thermal insulation is a physical barrier that prevents the unnecessary heat gain/loss, and it is essential to achieve thermal comfort of the occupants. In narrow sense "insulation" refers the materials having a k-value lower than 0.05 to 0.07 W/mK. These materials are being used to provide a considerable slowed down flow of the heat. As conduction is the major mode of heat transfer and air is a low-cost insulator, these products should be manufactured from low-density (porous) or low-conductivity materials.

It can be possible to mention the two main types of insulation:

Bulk Insulation is relying on the resistance capacity of the materials having pockets trapping air within the structure.

Reflective Insulation is relying on the materials' reflection capacity of radiant heat flow because of its high reflective and low emissivity characteristics, e.g. shiny aluminium foil coating (www.buildingscience.com, www.buildwise.org).

Thermo controller valves are the instruments that enable to control the level of conditions e.g. temperature, liquid, flow, etc. by completely or partially opening/closing in response to the signals acquired from the controllers, by comparing a set-point to a process variable whose value is provided by sensors (Bela G., 2003).

The blower door test is conducted by mounting a high powered fan to the exterior door frame which pulls the air out of the building. The difference in pressure inside versus outside the building is measured and overall air-tightness of the building is determined. In a typical blower door test the fan blows air out of the house to create a slight pressure difference between the inside and outside of the house (Figure 21). This pressure difference forces outside air into the house through all holes, cracks, and penetrations in the building envelope.

Figure 35 A blower door test measurement (energysolutionsnm.com)

Thermal comfort is defined in British Standard BS EN ISO 7730 (2006) as:

'*that condition of mind which expresses satisfaction with the thermal environment.*'

Thus, the term 'thermal comfort' describes a person's psychological state of mind and is usually referred to in terms of whether someone is feeling too hot or too cold. Thermal comfort is very difficult to define because you need to take into account a range of environmental and personal factors when deciding w hat will make people feel comfortable. These factors make up what is known as the 'human thermal env ironment'.

The best that you can realistically hope to achieve is a thermal environment that satisfies the majority of people in the workplace, or put more simply, 'reasonable comfort' (hse.gov.tr).

Thermal conductivity (k-value) is defined as the amount of heat energy transferred per unit thickness f or a given temperature difference, expressed in W/mK. The lower this value the more energy efficient is the material (Smith, P.F., 2004). However, the thermal conductivity of a material is affected by densit y, moisture and temperature of the material, e.g. when the material is moisture saturated the thermal co nductivity is increased.

Thermo-hygrometers are the tools to measure the temperature and relative humidity. By inserting diffe rent probes, it is possible to take measurements from different width levels of the building member. The relative humidity, together with the ambient temperature influences the thermal comfort of the building.

Triple zero house (Germany); The annual balance of calculated primary energy consumption is 0. Use of recycled material only (closed material loop). The annual balance of emissions (from energy consump tion) is 0 (Erhorn, H. and Erhorn-Kluttig, H. 2011).

Trombe wall is named after a French engineer Félix Trombe, who popularized this heating system in th e early 1960s. The idea actually goes back a lot further. A thermal-mass wall was patented in 1881 b y Edward Morse. In the U.S., interest in Trombe walls emerged in the 1970s, aided by researchers at L os Alamos National Laboratory in New Mexico. Trombe walls are particularly well-suited to sunny clima tes that have high diurnal (day-night) temperature swings, such as the mountain-west (Figure 22). They don't work as well in cloudy climates or where there isn't a large diurnal temperature swing (www.treeh ugger.com).

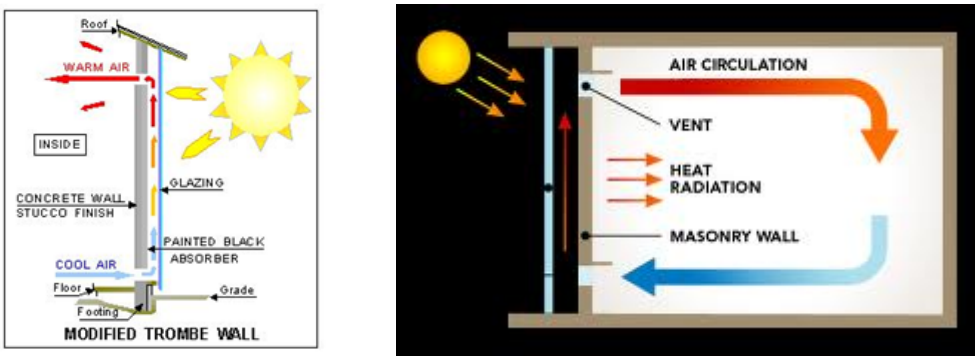

Figure 36 Working principle of Trombe Wall. (www.sierraclubgreenhome.com)

U-value is the measure of the rate of heat loss through a material. It is measured as the amount of heat lost through a one square meter of the material for every degree difference in temperature either side of the material. U-value is indicated in W/m²K (English Heritage, 2010).

Very low energy house is any type of house that from design, technologies and building products uses less energy, from any source, than a traditional or average contemporary house. In the practice of sust ainable design, sustainable architecture, low-energy building, energy-efficient landscaping low-energy houses often use active solar and passive solar building design techniques and components to reduce th eir energy expenditure.

The definition of very low energy buildings varies significantly across Europe even though the EPBD (Ene rgy Performance of Buildings Directive) give guidelines for the calculations. The variation exists not only in terms of the absolute level of energy consumption in a low energy building, but also the deviation fro m the minimum requirements as stated in the national Building Regulations (see Technical issues). Further the national calculation methods vary from country to country, which makes it rather complicated to com pare the absolute values of the energy requirements. The EU project ASIEPI (Assessment and Improveme nt of the EPBD Impact (for new buildings and building renovation), 2007-2010, will make a benchmarki ng method in order to compare the current energy performance requirement levels in the MS and to ma ke it possible to follow the evolution of the requirements over time.

Therefore it was not the intention of this study to compare the absolute level of requirements for the diff erent definitions used.

Water and moisture insulation water can enter into the structure by percolation in liquid phase and by means of air currents, diffusion through materials and heat transfer, in vapour phase (energy.gov). In a ddition to structural integrity, moisture is also harmful on human health in terms of the possibility to provi de an available environment to micro-organisms. The dampness in structural elements based on three ty pes:

- Rising or capillary dampness,
- Falling or penetrating dampness,
- Condensation dampness.

Water and moisture insulation of an element or a whole-building can be provided by using either flexi ble materials e.g. bitumen mastic, metal sheets, rubber, etc. and rigid materials e.g. rich concrete, stone slabs, etc...

White certificates are issued by independent certifying bodies confirming the energy savings claims of market actors as a consequence of energy efficiency improvement measures (EPBD 2006).

Yearly heating/cooling demand is the total heating or cooling energy that has to be supplied for the building from heating or cooling system per year.

Zero-energy house-Zero-emission house-Zero-carbon house

The definitions for zero-energy/emission/carbon buildings can be interpreted in different ways and sho uld be analysed with care. These buildings can either be defined as to consume no energy or emit no c arbon at all, which is a very expensive strategy, as large storage systems for heating and cooling or ev en for electricity are needed, or they can be defined as yearly balanced buildings. In this case, the buil dings stil consume energy, but produce in one period of the year at least as much energy as they need during the whole year. The realisation is mostly made by including renewable technologies (mainly sola r and/or biomass) in the energy concept. Thus, the buildings have the same definitions as energy/emissi on/carbon neutral buildings. (Erhorn, H. And Erhorn-Kluttig, H., 2011).

A Zero Energy Home (ZEH) combines high levels of energy efficiency with renewable energy systems to annually return as much energy to the utility as it takes from the utility –resulting in a net-zero energy c onsumption for the home (www.toolbase.org).