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Stakeholders and the Decision Making Process Concerning Sustainable Renovation and Refurbishment in Sweden, Denmark and Cyprus

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Abstract –This article examines the decision making process related to sustainable renovation and refurbishment in buildings. The utilized methodology identifies three distinct phases in order to instigate an engagement in sustainable renovation, by means of questionnaires and semi-structured interviews. In particular, the attitude of stakeholders in Sweden, Denmark and Cyprus to sustainable building renovation/refurbishment is studied through three separate case studies. Within the framework of this study, it is identified that building physics and durability are the most important drivers for energy renovation. In Sweden, Denmark and Cyprus, these factors are contributed by maintenance, deterioration and moisture, respectively. The results of the questionnaires and semi-structured interviews presented herein provide an insight into the renovation process in the aforementioned countries and reveal that economy is not the most important driver for energy renovation. Instead, the results signify that drivers such as improvement of indoor air quality and elimination of moisture in the building envelope are of crucial importance. Moreover, the practical implications of this research explore and identify existing instruments for sustainable renovation and refurbishment.

Keywords – Sustainability, Building Refurbishment, Decision Making, Built Environment, Sustainable Renovation

1. Introduction

The availability of energy for heating, transportation, lighting, and production of goods and services is an essential part of a society's infrastructure (Kahn Ribeiro*et al.*, 2007). The consumption of energy can however entail a number of disadvantages. One such disadvantage is the negative impact on the environment due to the usage of fossil fuels (Omer, 2008). Refurbishment can reduce the energy consumption to a certain level and in return contribute to less usage of fossil fuels. Despite the large number of refurbishment projects undertaken in the considered countries of Sweden, Denmark and Cyprus, there is a paucity of energy refurbishment indicators that stakeholders and decision makers can consider during the early stages of the refurbishment process (Gohardani &Björk, 2012b). The purpose of this article is therefore to provide an overview of the factors that influence the energy renovation process and act as the main drivers, for the aforementioned countries, based on three conducted questionnaires. The identification of these factors can contribute to better understanding of the attitude of decision makers in each distinct country and highlight similarities and differences between the countries in question.

A sustainable building design implies that reduced energy consumption within the building is actualized without usage of building materials that contain harmful substances (Huang*et al.*, 2012;Li*et al.*, 2013). Building materials of such nature can further lead to degradation of the indoor air quality and the ecosystem (Uhde&Salthammer, 2007). It is also important that as early as possible in the planning phase of a building project, aim for a sustainable approach, whether it involves new building or renovation projects. From this

perspective, the considered resources necessary associated with production, transportation, construction, operation and maintenance, are minimized and the decisions made by the stakeholders in the early stages of the project, will be beneficial upon its completion.

Building renovation and refurbishment involve different facets of architectural design, structural engineering and building services (Risholt*et al.*, 2013). The challenges pertaining to these topics concern retrofitting of historical and cultural façades of the existing building stock (Davies& Osmani, 2011). The main objective of this undertaking is therefore primarily to evaluate the possibilities of energy refurbishment in order to enhance the energy performance of the building and secondly to provide a formation of additional architectural values. The decision platform for making the appropriate choices between the different aspects of renovation is rather vague and involves many degrees of freedom. Perhaps, the most significant issue raised in this context, is the relatively convoluted choice to recognize that sustainable and economic aspects are interrelated, i.e. the overall impact of all made decisions is of vital importance (Gohardani &Björk,2012a;Gohardani,2012).

An engagement in sustainable refurbishment should generally involve making decisions about the following phases:

1. Design phase
2. Building phase
3. Use, operation and maintenance phase

In the design phase, calculations and estimations relating to design of the building's service life is carried out. Moreover, sustainable building materials are chosen, with the objectives of maintaining and preserving the architectural values of historical and cultural façades. During the building phase, building envelopes with high-efficient insulation materials are employed, which lower the overall heat transfer coefficient *U-value* without decreasing the architectural significance of the construction. The use, operation and maintenance phase further enable the implementation of energy efficient HVAC systems, motion sensing lighting systems and energy visualization tools. The stakeholders are also involved in different stages of the building process.

2. Sustainable Renovation and Refurbishment

The findings of this article originates from the joint research project: "A concept for promotion of sustainable retrofitting and renovation in early stage" (ACES), in which Royal Institute of Technology, Sweden, Technical University of Denmark, and Frederick Research Center, Cyprus are involved(Swedish ScienceNet, 2010). The incentive of the project stems from the fact that approximately more than 40% of the total energy in Europe is spent within the buildings sector, which significantly contributes in greenhouse effects and air pollution (UNEP, 2007).

The core issue of this study isconcerned with the fact that decisions about refurbishment should be considered at an early design stage, when usually no decisions are made about future refurbishment measures. Hence, by employing this approach, a plan is made for renovation measures that will result in the building operating in a sustainable manner. This project seeks to underpin the motivation of building owners to renovate buildings for improved performance considering energy efficiency and indoor comfort (Jensen, 2011). The objectives of the ACES project can be summarized as follows:

I. To exhibit that restoration resulting in a sustainable development can be motivated by economic reasons
II. To explain how quality assurance can contribute to a sustainable development
III. To explain how workers' health issues can contribute to a sustainable development
IV. To produce documents that will motivate stakeholders to continue their development towards sustainable renovation

This study is primarily devoted to identification of factors of importance to initiate energy renovation measures, hence objectives I and IV of the ACES project are partially considered within the framework of the conducted research herein.

1.1. Case Study – Sweden

In Sweden, one of the considered refurbishment cases was utilized in order to exhibit the identified parameters of crucial importance within a refurbishment process. For this particular renovation project, a collective of 14 apartments and two rooms were refurbished to 18 apartments. In order to enhance the performance of the new refurbished building, initially thermal insulation with a thickness of 400 mm was added to the attic area,as the previous insulation was removed. In addition, sections close to the radiators within the apartments were supplied with additional insulation materials. Other means of upgrading, involved improvement of the indoor climate and usage of a more efficient ventilation system. The aftermath of the refurbishment process, entailed in a more pleasant indoor climate. The findings of the Swedish case study are in part based on the responses from stakeholders involved in the aforementioned refurbishment project and questions shown in Appendix I, but also supported by responses of a questionnaire survey with 50 respondents, shown in Appendix III. These questionnaires were disseminated electronically and considered on a non-personal basis.

1.2. Case Study – Denmark

In Denmark, a needs and stakeholder analysis were conducted following an initial literature review (Advice A/S, 2011). The analysis was carried out through 10 interviews with different stakeholders in order to determine their point of view and needs in relation to sustainable retrofitting of buildings in Denmark. The interviews were conducted with representatives from the Danish Association of Construction Clients, the Danish Ecological Council, 3 facilities management organizations and building clients (housing association, real estate administration and municipality), 3 consulting engineering

companies and 2 contractors.

The interviews had a qualitative form and were of a semi-structured nature. A general interview guide with themes and questions was prepared in advance and some questions were omitted while others were included during the course of the interviews. The interview guide is shown in Appendix II. Interview minutes were sent to the interviewees for acceptance. The interviews were compared and analyzed in search for common issues and topics that stakeholders find important in relation to sustainable retrofitting of buildings. Based on the literature review and the analyses a proposal for a tool for evaluation of renovation projects, the tool RENO-EVALUE was developed. Due to lack of adequate number of responses the questionnaire in Appendix III, could not be used in Denmark.

1.3. Case Study – Cyprus

A questionnaire survey consisting of 10 questions were completed by contacting approximately 50 building owners, consulting engineers and building contractors. The questionnaire included general questions about the ownership, related specific environmental concerns and particular barriers for integrating environmental aspects into building renovation activities. A similar questionnaire as the one used in Sweden was utilized in Cyprus.

3. Methodology

The adopted methodology in this study has utilized a triangulated approach, consisting of a conducted literature study in conjunction with questionnaires and semi-structured interviews. Upon an initial literature review, an insight has been obtained regarding the questions that might be of an interest. Hence, the literature review has served as the basis for the design of the questionnaires in each country. The purpose of the questionnaires have been to summarize the most relevant parameters related to durability/building physics, economy, environment, comfort and other important drivers that may be of vital importance in energy renovation projects. Upon gathering of the data in each distinct country, the most important factor within each of the aforementioned categories is identified.

4. Results

4.1. Case Study – Sweden

The case study conducted in Swedenexhibits that the majority of stakeholders in Sweden consider that energy efficient solutions in building refurbishment to be instigated by drivers related to economy, environment and maintenance.A lack of information or marketing in terms of brochures for developers and energy refurbishment is also identified based on the responses to the questionnaire. A number of stakeholders suggest that contractors and consultants offer energy efficient suggestions at an early stage, such that these will be considered.

The questionnaire survey in Appendix I, also considered the tools that were utilized by the stakeholders in order to assess the energy refurbishment needs. It was found that this included but was not exhaustive to a number of in-house software applications and also spreadsheets in the Microsoft®Excel environment.

The findings of the questionnaire presented in Table 1. and Appendix III, indicate that the most important factors for energy renovations in Sweden potentially can be contributed to heating and cooling performance, reduction of electricity and energy bills plus improvement of the indoor air quality. For Sweden, an improvement of the natural lighting conditions is the least important factor that would constitute a reason for instigating energy saving measures, according to the conducted survey. The respondents to this questionnaire were mainly stakeholders, property managers and building developers. These individuals possess a vast experience related to building operation and facility management. Nonetheless, the obtained results from this questionnaire can be viewed as representative for the aforementioned stakeholders, but perhaps not entirely reflect the views of the general population in questions concerning energy renovation in Sweden.

4.2. Case Study – Denmark

In the beginning of the analysis it was important to determine key motivators for renovation of buildings in Denmark. It was however not a simple task since earlier research has documented many barriers for initiating building renovation projects. The barriers can generally be divided into two categories: economic and informational barriers. Lack of financial incentives and life cycle perspectives are the most significant economic barriers while too little political consciousness; lack of common direction amongst the main stakeholders, lack of overview and where to prioritize, are the most important informational barriers. In addition, new constructed buildings are considered more attractive and get more attention than existing buildings. In general, the problem is not a lack of technical solutions but more of a problem to get the building owners to implement the existing solutions (Gram-Hanssen& Haunstrup Christensen, 2011).

Almost all stakeholders mentioned deterioration of buildings as a key motivator for energy renovation. In some cases, problems with indoor air climate in newer buildings are motivators for renovation involving energy optimization. In public institutions, housing associations and private companies, energy renovations are often used for branding or as a part of an organization's strategy in relation to Corporate Social Responsibility (CSR). It is seen that especially global companies located in Denmark are requiring energy efficient buildings from their landlords.

In Denmark, energy labeling of buildings was implemented in 2007 with the intention of becoming a driving force for energy renovation projects, but it is not very popular (IEA, 2007). It is rarely used as a motivator for energy renovations

and some say it is due to energy labeling being primarily based on theoretical calculations which do not reflect reality quite well. Especially for social housing, a revised system of energy labeling is now being introduced to meet the criticism.

The state of the market is an important factor when discussing energy performance and renovation of buildings. Today tenants may have a slight advantage over landlords and can make demands that they probably could not in case of a financial boom. That is why the owners of the energy efficient buildings have better opportunity to rent their buildings out today than the owners of the energy inefficient buildings, anticipated that other criteria such as correct rent price, location etc. also are satisfied. Through the analysis it was confirmed that building users often have different interests, but this varies depending on the type of buildings. Public schools and listed buildings are usually part of a political agenda since they get a lot of attention from the inhabitants every day. Energy renovations in social housing in Denmark are highly dependent on residential democracy. It means that the majority of the residential voters have to support the idea; otherwise it will not be realized.

The landlord/tenant dilemma (Ástmarsson, 2012) is present in the private building sector in Denmark and considered to be one of the biggest barriers for energy renovation projects (Jensen*et al.*, 2011). The landlord provides the tenant with housing, appliances and installations, and the tenant pays the energy bill. The landlord is therefore not motivated to invest money in energy efficiency if this cannot be compensated with higher rents. The tenant probably wants to lower the energy costs but only with unchanged rent. This is where the dilemma occurs. The legislation in this field is very complex and the maximum rent is regulated by law which in many cases is an obstacle for energy renovations because the maximum possible rent in most cases is insufficient for financing investments.

In the analysis, none of the interviewees could present pure energy renovation projects. This, sinceenergy renovations in Denmark are mostly combined with general refurbishment, moving/redesigning, or as last minute solutions when service life of building components already has expired.

There are a couple of parameters that have an impact on a decision process. In many cases, payback time is the most important parameter when considering energy renovations. Decision makers are mostly interested in short payback times which do not require huge investments. Typical examples could be replacing light bulbs and IT equipment, optimizing ventilation or heating units, and installing photovoltaic panels.

Comprehensive renovations such as re-insulation of the external walls, replacing windows, or roof replacement are more complex and thereby more expensive initiatives with a long payback time. They require long term planning and usually involve several parties such as architects, engineers, consultants, entrepreneurs, developers, building users etc.

Because of the complexity of comprehensive renovations, many calculations and simulations are performed beforehand, but according to the research, credibility of these results is questionable (Magrini*et al.*, 2012). Almost all interviewees mentioned that in many projects which they have been involved in, there was a remarkable difference between calculations and true energy performance. This difference was mostly estimated to be 10 – 30%. Some blame the calculation tools for this inaccuracy, others think that the baseline is usually not set correctly, and many also believe that it is user behavior which in the end makes the difference. There are also some interviewees who think that the inaccuracy is the result of poor workmanship during the construction process.

The lack of confidence in achieving expected energy performance is an important reason for an increasing interest in Denmark for ESCO (Energy Service Companies) or EPC (Energy Performance Contracts), where a company promise guaranteed energy savings to the building owner. Particularly, many municipalities have initiated ESCO projects in recent years(Jensen*et al.*, 2011), but an increasing interest among other types of building owners is also becoming evident. ESCO is seen as a possible way to overcome the landlord/tenant problem - not least in private rented housing.

Energy renovations in Denmark are usually included in two types of projects: comprehensive refurbishment and energy optimization. In comprehensive refurbishment, energy renovation is part of a large project in which architectural and social parameters are also included. Such energy renovations often comprise both building envelope and technical installations and also increasingly renewable energy solutions like photovoltaic panels. Energy optimization projects are mainly focusing on technical installations such as HVAC, their performance, maintenance and correct usage. In relation to correct usage, it is very important to work with user involvement and user behavior, since they are consumers of the final product.

There are many ways to affect user behavior. Some stakeholders mentioned visualization of energy consumption, internal competitions on energy consumption, education of technical staff, as well as passionate local ambassadors as effective methods for achieving better energy performance. By automating technical installations, some uncertainties regarding user behavior can be removed. In this case, it is important to explain to caretakers and technical staff how equipment should be operated and maintained.

Non-energy benefits (NEBs) are the benefits that follow with energy renovation projects as a side effect and are difficult to express in numbers. Typical non-energy benefits are indoor climate improvements in terms of better comfort, more daylight, less draught etc. According to the research, better indoor climate is directly linked to more productivity and less sickness absence which makes NEBs very relevant for office companies. On the other side, NEBs are not usually a decisive factor in the private sector but can be used as a good argument in the initial phase of renovation projects.

Since NEBs are difficult to express in numbers, they are not taken into consideration when calculating rentability, but several interviewees think that it should be changed, so that

NEBs can become a valid parameter in energy calculations. However, there are also some interviewees who claim that it is difficult to talk about non-energy benefits in advance and say that they are first discovered when the energy renovation is completed.

4.3. Case Study – Cyprus

The questions and the summarized findings of the questionnaire survey are shown in Table 1 and Appendix III.Following the survey, a statistical analysis was carried out on the responses of the questionnaire. This specific questionnaire was easy to assess and was based on the importance and irrelevance of the questions. Hence, the respondents solely had to complete the questionnaire by expressing their thoughts about the importance of each question.

Table 1. The questionnaire used in Cyprus and Sweden, and the respective importance and lack of importance of the questions in percent

Question	Cyprus [%]		Sweden [%]	
	Yes	NO	Yes	NO
1. Is the improvement of building aesthetics an important aspect for energy renovation?	96	4	60	40
2. Is elimination of moisture an important aspect for energy renovation?	96	4	90	10
3. Is improvement of electrical safety an important aspect for energy renovation?	80	20	60	40
4. Is an increase for expected future monetary benefit (income) an important aspect for energy renovation?	74	26	80	20
5. Is an improvement of the building's environmental footprint an important aspect for energy renovation?	68	32	90	10
6. Is an improvement of heating and cooling performance an important aspect for sustainable renovation?	80	20	100	0
7. Is a reduction of electricity and heating bills an important aspect for sustainable renovation?	80	20	100	0
8. Is an improvement of natural lighting conditions an important aspect for sustainable renovation?	70	30	50	50
9. Is an improvement of indoor air quality an important aspect for sustainable renovation?	90	10	100	0
10. Is use of renewable energies an important aspect for sustainable renovation?	74	26	80	20

This method was a simplified measure in order to provide useful insight into the building owners' perception about sustainability. Based on the findings of the questionnaire survey, the following points can be deduced. Initially it is found that the majority of the building owners consider improvement of building aesthetics as an important aspect. This entails that energy renovation should utilize this fact and embed energy saving functions in building aesthetics improvement functions e.g. paint with cool colors, or install exterior insulation, in cases where the plaster is damaged.

A strong inclination in the study further exhibits that elimination of moisture is an important renovation aspect. Energy saving functions should be completed within moisture protection by installation of exterior or interior insulation.

In addition, an improvement of electrical safety is an important driver. In this context, smart building automation or smart metering should be embedded upon updating of the electrical installations. Another important factor in terms of energy renovation is the income. Hence, if the building is going to be rented or sold, it is crucial to highlight the importance of an energy label class and address the increase in market value of the building.

Reduction of the environmental footprint of the building is a factor that needs to be considered according to the questionnaire survey. The results of the building energy analysis should therefore be presented and highlight the level of energy and CO_2 emissions that can be saved upon employing energy renovation on the building.

The questionnaire results further exhibit that the sanitary appliances is also an important driver. In this case, sanitary appliances that are of water preserving nature should be communicated to the building owners. Furthermore, installations which make use of the greywater could be promoted.

Thermal heating and cooling performance is moreover identified as an important factor based on the questionnaire survey. A reason for this can be attributed to thermal comfort. In this case, an exterior insulation and automated sun protection of the building should be promoted.

In this context the energy bills are an important driver for investing in renovation. Simple energy renovation actions can for this reason be, replacement of old burners and air conditioners with newer energy saving ones. Natural lighting conditions should further be considered in order to promote investment in renovation. In essence, replacement of old windows with larger ones and preferably energy saving windows, with triple glazing are possible solutions, in this context.

For the participants in the questionnaire survey, the indoor air quality is estimated to be important for refurbishment of their dwellings. In this case, products and equipment with reduced air pollutant emissions should be installed and old equipment emitting high amounts of air pollutants should be replaced. Windows with adjustable positions (half open) should further replace old window installations. The perception of the majority of the respondents to the questionnaire was that increasing the use of renewable energy systems is important for renovation. For meeting these demands photovoltaic or solar thermal systems could be installed.

For the questionnaire survey conducted in Cyprus, in

general all aspects raised in the questionnaire are considered to be important for the participants. The percentages of importance in this regard vary between 64% and 96%. The quantitative analyses carried out in this study have identified the priorities, needs and drivers of Cypriots for building energy renovation.

From the survey, it is identified that the drivers for renovation of a building are not explicitly related to energy saving issues. Instead, energy saving and cost issues are classified as the second most important concerns. This is in contrast with the case of new buildings where cost and energy labels are considered to be most important. The findings also suggest that the energy renovation activities should be embedded within classical renovation activities. This is an advantage for promoting energy renovation as it eliminates the total cost of energy renovation activities.

5. Discussion

The three survey studies from Sweden, Denmark and Cyprus have utilized slightly different research methods. The study from Cyprus and Sweden utilized a structured questionnaire with one out of two possible closed answers for each of the 10 questions. In addition, the Swedish study used a structured questionnaire with 19 open questions. The Danish study included 10 qualitative semi-structured interviews based on an interview guide with open questions. The reasoning behind utilizing different research methods originated from the challenge of obtaining a large enough sample size for all three studies. This fact is indicative of the usage of semi-structured interviews in the case study in Denmark.

In spite of these differences, it isnonetheless possible to compare the results. The general motivators and drivers for energy renovation are quite similar across the three countries. A summary of the most important drivers in the considered countries is shown in Table 2. While, the mentioned factors shown in this section, convey an overall view of the factors that may influence the decision making process for stakeholders, the list shown in Table 2 is not exhaustive.

Table 2. The Identified Drivers for Energy Renovation for the Considered Countries

Factors	**Sweden**	**Denmark**	**Cyprus**
Durability/ building physics	Maintenance	Deterioration	Moisture
Economy	Cost	Payback time	Cost, income
Environment	Energy savings	Energy savings, local energy production	Energy savings, Eco-friendly products
Comfort	Indoor climate	Indoor climate	Indoor air quality
Others	N/A	Branding, CSR	Building aesthetics

The drivers will certainly vary for different types of buildings and organization in each country, but in Table 2, they are grouped based on the main factors durability/building physics, economy, environment and comfort. The main factors in Table 2 are listed by their importance, which means that "durability/building physics" is considered to be the most important factor for sustainable renovation. The economic drivers are on a second place, followed by the environmental drivers, comfort issues and other relevant topics.Based on the questions in Appendix III, a joint compilation of the importance of different factors that are crucial concerning energy renovations are depicted in Fig. 1.

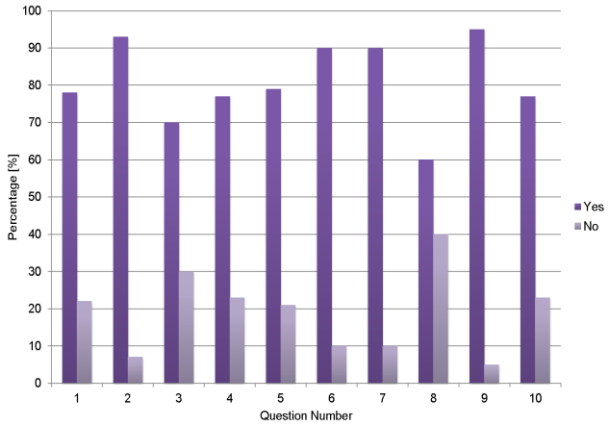

Fig.1. The importance of Questions 1−10 and the corresponding percentage

Based on Fig. 1, it is evident that factors such as an improvement of indoor air quality and elimination of moisture, improvement of heating and cooling performance, as well as reduction of electricity and heating, are dominating factors for both Cyprus and Sweden that in turn will instigate energy renovation measures. The fact that there is a synergy between the findings of this study between two distinctly different countries in terms of climate i.e., Cyprus and Sweden, is indicative that these factors indeed are important when considering energy renovations.

Moreover, the questionnaire in Appendix III, could be tailored such that it would highlight other factors besides those considered herein and more explicitly target distinct details within the refurbishment process. Nonetheless, such difference in compiling the questionnaire would imply that the number of questions would have to be at least twice as many.

However, while an extended version of this questionnaire would possibly yield that more identifiers could be highlighted for energy renovations, this task would be carried out at the expense of less obtained responses from the respondents. The reasoning behind this statement is derived from the difficulty of obtaining responses for lengthy questionnaires that have been disseminated electronically.

6. Conclusions

In light of the conducted study, this article exhibits that durability/building physics, is the most important driver, concerning energy refurbishment in the context of the conducted study in Sweden, Denmark and Cyprus. It is a characteristic in all three countries that energy renovation is mostly undertaken at more comprehensive refurbishments, where upgrading the building in a more general sense has become necessary. Pure energy renovations mostly concern limited measures with limited payback time. It is noteworthy that the factors are largely influenced by the national bodies and the attitude of the stakeholders within each country and the general view on environmental issues and energy savings.

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Appendix I – Interview Questions in Sweden

Q1. Describe a brief description of the following: Your professional background, you current position and the main specialty of the company where you are working.

Q2. How do you consider that the majority of the energy efficiency projects are initiated? What are the drivers in this context?

Q3. Which actors have you been working with of the following: Private persons and organizations, companies and entrepreneurs and official organizations?

Q4. For the actors specified in Q3, what factors are most interesting related to energy refurbishment projects?

Q5. Do you consider that specified actors in Q4, place stringent demands on new type of projects, project development and project participant?

Q6. Has your company any printed materials or brochures for developers concerning energy saving renovations? Which demands are imposed on developers concerning the availability of energy savings?

Q7. Does your company offer specific products or package solutions to its customers concerning services and measures?

Q8. Which tools/models does your company incorporate in energy saving projects (LEED, BREEAM, DGNB, etc.)?

Q9. What specific tools or software does your company employ upon assessment of economy, environments and actors in building refurbishment projects?

Q10. What are the advantages and disadvantages with previous mentioned tools and software?

Q11. How are the energy refurbishments projects carried out as independent projects or in combination with regular renovations or refurbishments?

Q12. Can you mention a number of specific cases, and briefly describe the refurbishments taken place in these projects?
Q13. Specify the initiatives commonly encountered in energy refurbishment projects? Are there any energy saving measures or implementation of reusable energy sources incorporated in these measures (additional insulation, energy-efficient windows, sun panels)?
Q14. Which factor is usually the most important for an energy refurbishment project, economy and other parties?
Q15. What is the focus on living satisfaction concerning the participation of building dwellers (indoor climate, comfort, automatic operated luminaires)?
Q16. Please provide a brief general description of the work process in a renovation project (for instance it would be useful to describe how energy refurbishment projects are initiated, analyzed, carried out and evaluated).
Q17. Could you mention the challenges and conflicts that can occur during the course of the project? What do you believe that these challenges or conflicts are caused by?
Q18. Based on your experience, what do you believe the decision makers are seeking with regard to energy refurbishment projects?
Q19. Which are the typical questions concerning the economy, environment and parties that the decision makers impose on energy refurbishment projects?

Appendix II – Interview Guide from Denmark

- Please, shortly introduce yourself, your background and your company profile.
- How are energy-renovation-projects (ERP) initiated? What are the driving forces?
- Which stakeholders have you been working with? (Private clients and organizations, companies/contractors, public organizations etc.)
- What is important to them (in relation to ERP)? Why?
- Do some of them have special requirements?
- Do you have specific material/booklets for building developers about energy renovations? What is their information needs/demands?
- Do you offer package solutions or specific products?
- Which tools/models do you apply when working with ERP? (i.e. LEED, BREEAM, DGNB etc.)
- Which specific tools/pc-programs do you use when assessing:
    - Economy?
    - Environment?
    - Stakeholders?
- What are their pros and cons?
- How are energy renovation projects realized: as *independent projects* or *in combination with general renovation/maintenance*?
- Can you mention some relevant cases, and describe what was done in them?
- Which initiatives are typically included in energy renovation projects? Is it for instance *energy saving measures* or implementation of *renewable energy sources*? (new, energy-efficient windows or solar cells?)
- Usually, what is most important in ERP: *economy, environment, or stakeholders*?
- How much focus is on *user-behavior* and *user-involvement*? (i.e. indoor climate and comfort)
- Can you give us general description of the process that goes on when working with ERP? (How are ERP initiated, analyzed, implemented, evaluated)
- Are there some challenges or conflicts during the project process? What are they caused by?
- Based on your experience, what do you think that decision makers are searching more for, in relation to ERP?

Appendix III – Questionnaire Used in Cyprus and Sweden

1. Is the improvement of building aesthetics an important aspect for energy renovation?
2. Is elimination of moisture an important aspect for energy renovation?
3. Is improvement of electrical safety an important aspect for energy renovation?
4. Is an increase for expected future monetary benefit (income) an important aspect for energy renovation?
5. Is an improvement of the building's environmental footprint an important aspect for energy renovation?
6. Is an improvement of heating and cooling performance an important aspect for sustainable renovation?
7. Is a reduction of electricity and heating bills an important aspect for sustainable renovation?
8. Is an improvement of natural lighting conditions an important aspect for sustainable renovation?
9. Is an improvement of indoor air quality an important aspect for sustainable renovation?
10. Is use of renewable energies an important aspect for sustainable renovation?