D.4.2

Strategy and planning for the social and behavioral evaluation

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DOCUMENT AUTHORS AND AUTHORISATION	
Lead & Author	Kathleen Zoonnekindt (Savills)
Contributor(s)	Savills, SinCeo2, Lands, ATER, PFP, Open Domo
Reviewed by	Savills, SinCeo2
Authorised by	Izabela Kurkowzka

DOCUMENT HISTORY

Version	Date	Modified contents	Implemented by
1	November 2015	1st sociological evaluation proposal presented to partners during 1st General Assembly	Savills
2	January 2016	Methodology & indicators finalized. Production of interview guideline with tenants and BO team & review and validation by each BO. Selection of the tenants to interview and monitor. Adaptation with Lands cancellation	Savills PFP Landskronahem ATER, SinCeO2

3	October 2016	Integration of the results from the 2 surveys results in Italy and UK in the first proposal for the Training Program	Savills
4	February 2017	First versions of social maps integrating the results analysis of the 2 qualitative enquiries in Italy and UK. Integration of the 2nd survey in Italy Pilot site	Savills
5	31.03.2017	Pre-final version – Quality review to be done	Savills, SinCeo2
6	2nd May 2017	Final Version	Savills

Executive summary

The current deliverable 4.2 describes the work performed from 01.10.2015 to 31.03.2017 for the sociological evaluation by the group of DREEAM partners involved in this task (Savills, SinCeO2, PFP, ATER, Lands, Chalmers).

In the current deliverable 4.2 we present the methodology developed for the sociological evaluation of 2 targets:

- Building managers' employees from the 3 building owners involved in the DREEAM project who directly manage the pilot site where the DREEAM renovations will be performed;
- A selected group of tenants in the 2 pilot sites in UK and Italy who will experience the DREEAM renovations process.

The detailed results of these interviews are presented in another deliverable 4.4 for each Pilot site in different thematic:

- Socio-economical context of the pilot site & households structure;
- Mapping of the life quality of tenants inside their dwellings and the pilot site area (thermal comfort, access to energy, fuel poverty situations, water consumption, renovations expectations, collective feeling in the building with neighbors, relations with the building owner);
- Mapping of the level of equipment of tenants with electric & electronic devices in the domestic area (lightning, cooking, entertainment & washing devices).

Summary

"The key is not to pay for what you have consumed but to consume for what you can afford and accept to pay"

(English tenant in situation of fuel poverty,
Pilot site of Padiham/UK, 1st sociological survey, 2016).

1 Methodology

The sociological evaluation in the DREEAM project is called "Tenant engagement program" and our methodology includes 4 key steps structured in a before/after approach:

1.1 STEP 1: The in-depth study of the tenants' life conditions and energy consumption patterns prior to the renovations

The understanding and engagement of tenants in renovation programs is essential for two main reasons:

1. **The understanding of life conditions before renovations from the user's perspective is an important completion of the technical analysis.**

- Insights on thermal comfort (humidity, air leaks, T° which often differ between dwellings, floors, orientations), on life habits in the buildings and social cohesion cannot be captured in a technical audit;
- The engagement before renovation consists of interviews and users' experience observations with numerous households (of various age, background, family structure) that are located at different parts of the building(s). Tenants are interviewed in detail about their thermal comfort, energy habits, uses of equipment, expectations for renovations & local life culture;
- These insights are important to build a well-designed renovation concept that will improve the socio-ecological sustainability of the renovated buildings and the life quality of tenants. **This concept of "socio-ecological sustainability" is one of the key aspect of our approach and is directly inspired by the best energy renovations projects launched in Sweden, and by the work of researchers from KTH Royal institute of Technology in Stockholm (Tunström et al., 2015)**.

Many successful projects on energy efficiency and deep renovations have fully integrated the social dimension. They have demonstrated for future projects the importance to study first the life conditions and energy consumption patterns of tenants prior to renovations. Secondly, successful energy efficiency projects in Europe have demonstrated the crucial role of tenants' acceptance and involvement to reach the expected energy efficiency results.

We have listed below some examples of successful energy projects or organizations that have developed social analysis and tenants' information/engagement programs:

DRUM Housing and Relish project, Luwoge communication campaign for tenants, Hallbara Ålidhem project with deep collaboration and co-design of solutions with tenants, Pro Postdam organization that has developed various successful tools to inform tenants, Kauno Energija with a comparative presentation of the bills and a display of the whole building consumption to empower tenants, les Compagnons Batisseurs de Provence & Geres with information campaign for households in fuel poverty situation, the creation of "tenants government" by WBG in Germany, the Järva project with environmental education offered to parents and children, the training of "energy referents tenants" by ACER Modena in Italy, and the co-design of technical solutions by tenants for deep energy renovations lead by Nantes Habitat in France.

2. **Secondly, understanding users' behavior allows to plan for preventative actions against social misuses after renovation.**

Misuses can lead to a decrease of the initially planned energy efficiency gains, or even to consumption's increase. Indeed, one of the important risk in energy renovations are the wrong use or the resistance and even the hijacking of new equipment by tenants because they don't understand how to use them, or the technologies/renovations are not adapted to their life/or cultural habits.

At last, the worst social phenomenon that can happen in the context of renovations project is the "rebound effect".

The "rebound effect" is originally a theory in economics applied nowadays in social sciences to describe take-back effects in various fields including energy consumption. This concept refers in sociological/behavioral sciences to the adaptation of tenants' behaviors after energy efficiency improvements in housing. Tenants experiencing new high energy efficient dwellings can feel less "guilty" to consume and use more their different electric equipment and radiators than before renovations, or they can start to purchase more equipment with the money they save (Zelem, 2013)[1], which results in the end in a decrease of energy savings expected by building owners.

In this context, our sociological qualitative approach should be a positive completion to the technical analysis in the DREEAM project.

[1] Zelem, University Negawatt, Mèze, 4-5 October 2013

In our sociological approach, we have adopted a qualitative methodology with in-depth interviews with tenants.

This qualitative approach is the more relevant method to study tenants' consumption patterns and especially in the Italian pilot site. Indeed, for the building manager and ATER project manager (Italy), our approach with qualitative semi-directive interviews is the only relevant and efficient method to collect trustful answers from tenants as a quantitative survey with questionnaire is by experience not adapted to their tenants:

- First, with a quantitative questionnaire few tenants would read it and send their answers, the engagement would be probably too low. Therefore, it is relevant to take appointment with tenants directly and to exchange with them in face-to-face;
- Secondly, the answers given by tenants in a survey questionnaire would potentially be biased or not precise. It would be difficult to check that tenants have understood the questions, and for complex topics like thermal comfort and energy saving habits, it is needed to interact with tenants in live to check that they have well understood the various questions, to question several times the relevance of their answers by asking practical examples (technic called "relance"). The project manager explained that tenants wouldn't take the time to read in detail the questions in a quantitative survey especially if it is long, which finally wouldn't guarantee a good quality of answers;
- The double questioning with a focus on the "how" (practical examples from real-life of interviewed tenants) is a classical and efficient tool in sociological qualitative survey (Becker, 1998) to evaluate if tenants in their answers tend to underestimate or overestimate their perception and their practices. The identification of potential declaration bias and the focus on experienced-based answers are more difficult to perform in a quantitative survey by questionnaire compared to qualitative interviews. "It is impossible to make only a questionnaire: it's impossible by letter for the questionnaire: you have to ask personally and directly the questions, if you give them a questionnaire they won't give the real answers, or they won't answer, we need to meet them and ask directly" (ATER employee – 2017)

1.2 STEP 2: Detailed sociological report (D.4.4) & Social mapping

1. **Sociological report with quantification of the qualitative results: a rigorous method**

   We have finalized a detailed sociological report *(deliverable 4.4)* with a rigorous and exhaustive approach to present the results of our enquiries:

   - The analysis of BOs employees' interviews has been presented thematically both in the deliverable 4.4 and the deliverable 4.5 *(Requirements of BO for the DREEAM platform);*
   - The analysis of tenants' interviews has been presented in the deliverable 4.4 with the detailed statistics of each answer per category, with also the full tenants' quotations from their interviews;
   - The interviews carried out with tenants were most of the time audio recorded following agreement of the different persons interviewed (tenants signed in their consent letter their approval to be audio-recorded during the interview);
   - Then the interviews were fully transcribed anonymously before the sociological analysis (audio recording was helpful to re-listen and transcript in detail the answers of tenants as interviews have been performed in English in UK and in Italian/English in Italy).
   - Each household has been assigned a code in the analysis table & the deliverables, and the sociologist has anonymized any information allowing to identify the household/tenants from their quotations or information (such as names expressed during interviews or other personal details);
   - All the 47 interviews have been rigorously transcribed either entirely or synthetically per thematic, anonymized and are available for consultation and analysis by the DREEAM partners.

2. **Full analysis grid:** we have built an exhaustive analysis grid of the interviews with a full transcription of all the 47 interviews, with an anonymous presentation of all the information & quotations collected with tenants by thematic. This tool allows to have a detailed & global vision of tenants' thermal comfort & life conditions before renovations. This grid will then be compared with the tenants' interviews performed again after the renovations.

3. **The results of the interviews will be presented in the form of a visual social mapping at the end of the project (2018 and 2019) to support an easy and visual comparison of tenants' thermal comfort and energy consumption before/after the renovations.**

   - Indeed Savills' sociologist has started to develop a visual presentation tool of tenants' interviews with a plan view (dwellings & building scales) to communicate simply & efficiently with building owners about the long sociological report that we have produced on tenants' interviews (4.4).

- This tool will continue to be developed until 2018. The final objective is to use this social mapping to visually compare the evolution of tenants' thermal comfort & satisfaction before and after DREEAM renovations, and to integrate it in the communication tools of the dissemination program.
- This innovative sociological tool is being developed and tested during the DREEAM project in addition to the original tasks described in the DOW, as it will support a better readability and communication on the sociological studies within the project with the other technical partners and building owners.

Another mapping initiative is currently being developed by a senior anthropologist researcher Dr. Rupp's for the project EnAct with the analysis and mapping of perception, and the analysis of the level of knowledge/information with "Energy IQ tests"[2].

[2] "*Mapping energy perceptions* & *Energy IQ test*: in 2002, the National Environmental Education and Training Foundation found that only 12% of US respondents could achieve a passing grade on 17 basic questions about energy. EnAct will create a similar test to assess current understanding, letting respondents compare results. EnAct aims to empower individuals to engage, whether by supporting energy access initiatives or better understanding how human demand for energy drives everything from production to pricing to pollutions levels".
Reference: http://en-act.org/the-project/overview/

1.2.1 Mapping per floor & dwelling scale

The mapping is based on the interviews done with each household, during when we use a plan of the dwelling where we draw in live the description of tenants (illustration below).

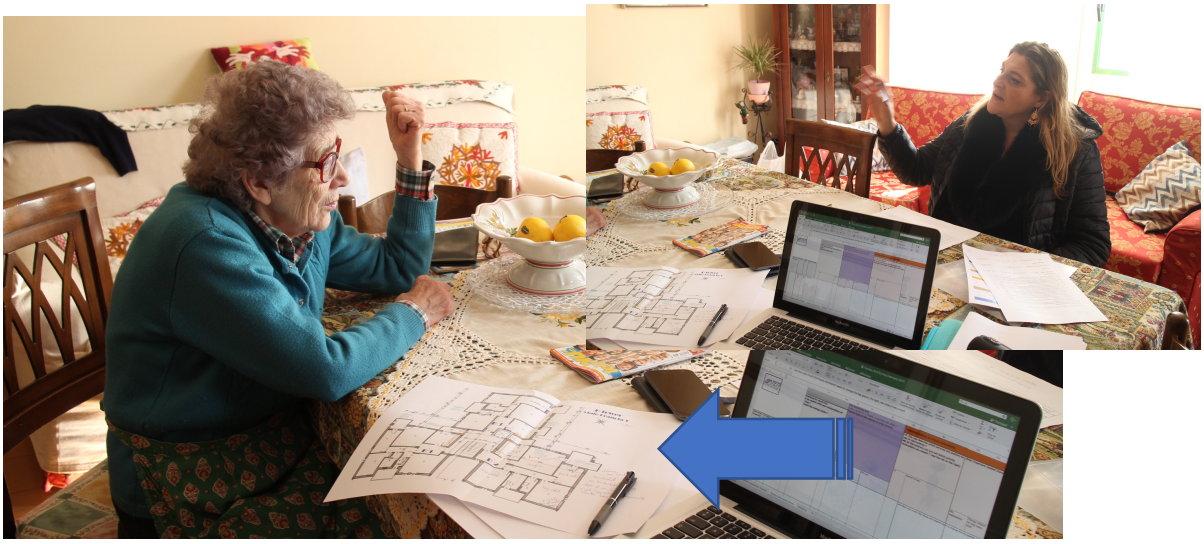
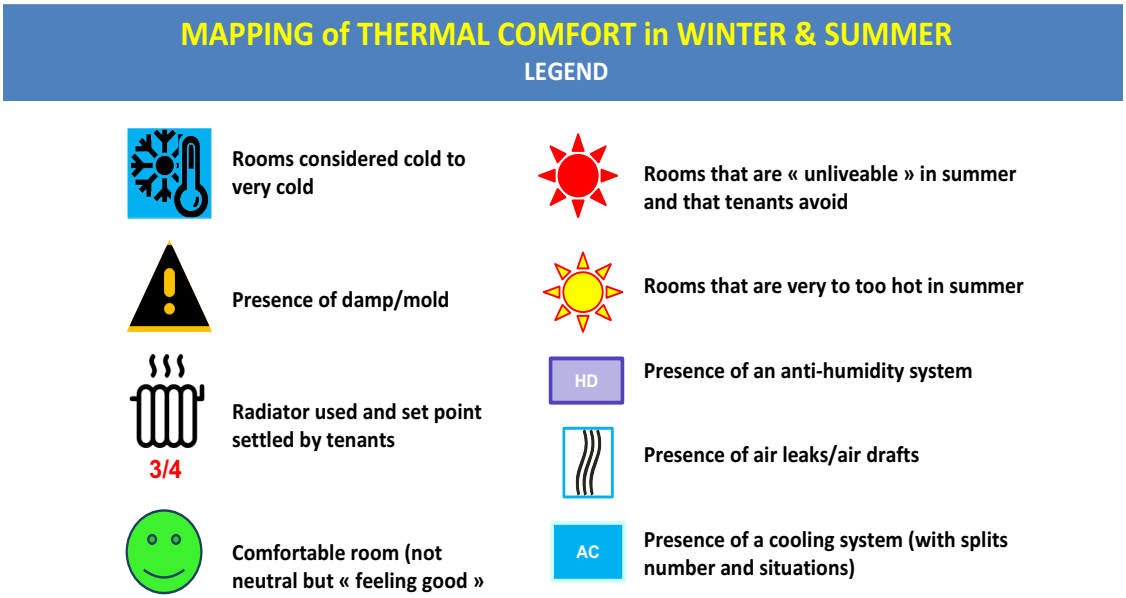
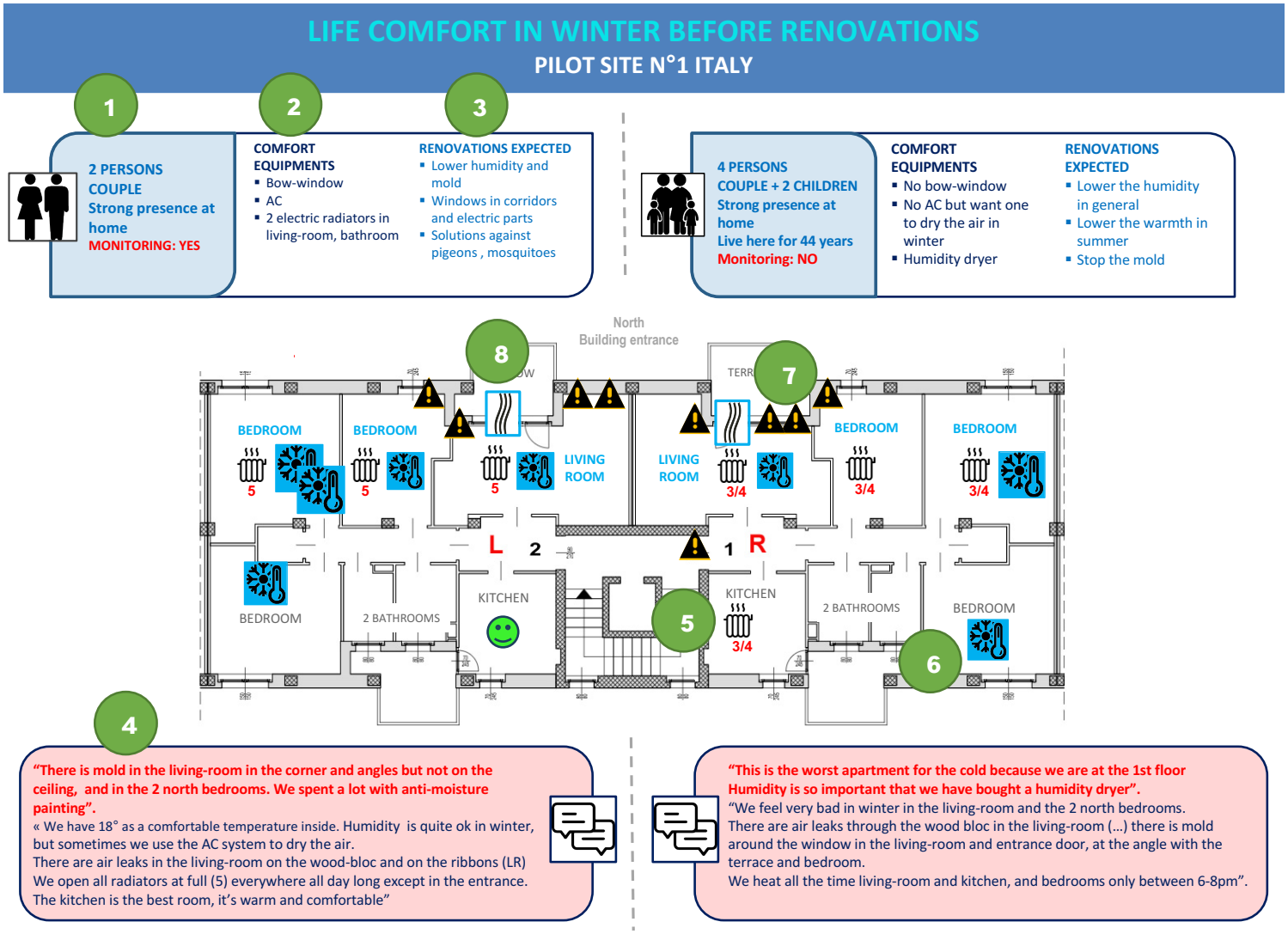


Figure 1: Interview with a lady in the 2nd pilot site in Italy (February 2017). The dwelling architecture map is visible at the 1st plan and was used during each interview to draw in live the thermal comfort and the other indicators of life quality by tenants themselves.

We have created an easy to read legend to visualize the answers given by tenants:



In the 2 next pages, you will find 2 examples of social mapping of the thermal comfort perceptions of tenants in summer & in winter living at a similar floor (here 1st Italian Pilot).



The visual mapping includes:

The household occupancy profile & thermal comfort perceptions

(1) A short anonymous description of the households living in the dwelling

(2) The key equipment owned by the tenants that involves additional electricity consumption (like cooling-AC or anti-humidity devices, and additional electric radiators)

(3) The key renovations expected by the tenants of the household to improve the life conditions and thermal comfort in the dwelling

(4) A selection of the more relevant quotations/explanations given by the tenants during the interviews to illustrate the situation in the dwelling.

A list of key thermal comfort indicators collected during the interviews:

(5) Perception of the thermal comfort in each room from "very cold" to "very good"

(6) List of radiators used regularly and the set point usually selected by the tenants

(7) Presence of damp/mold

(8) Presence of air leaks/air drafts

LIFE COMFORT IN SUMMER BEFORE RENOVATIONS

PILOT SITE N°1 ITALY

2 PERSONS
COUPLE
Strong presence at home
MONITORING: YES

COMFORT EQUIPMENTS
- Bow-window
- AC
- 2 electric radiators in living-room, bathroom

RENOVATIONS EXPECTED
- Lower humidity and mold
- Windows in corridors and electric parts
- Solutions against pigeons , mosquitoes

4 PERSONS
COUPLE + 2 CHILDREN
Strong presence at home
Live here for 44 years
Monitoring: NO

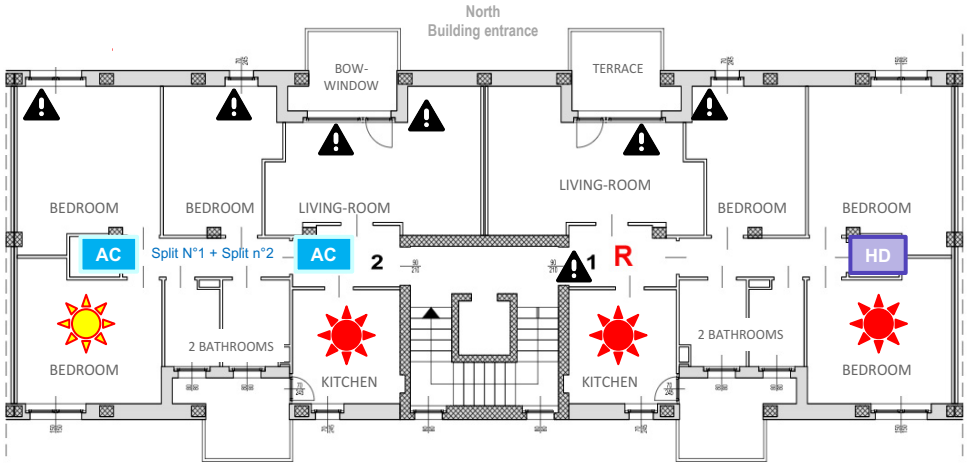
COMFORT EQUIPMENTS
- No bow-window
- No AC but want one to dry the air in winter
- Humidity dryer

RENOVATIONS EXPECTED
- Lower the humidity in general
- Lower the warmth in summer
- Stop the mold

AC

AC option cooling each day in July/August during 12h (6am to 6pm)

+ Habits to close shutters and windows in summer



HD

Humidity dryer each day in July/August during 3H

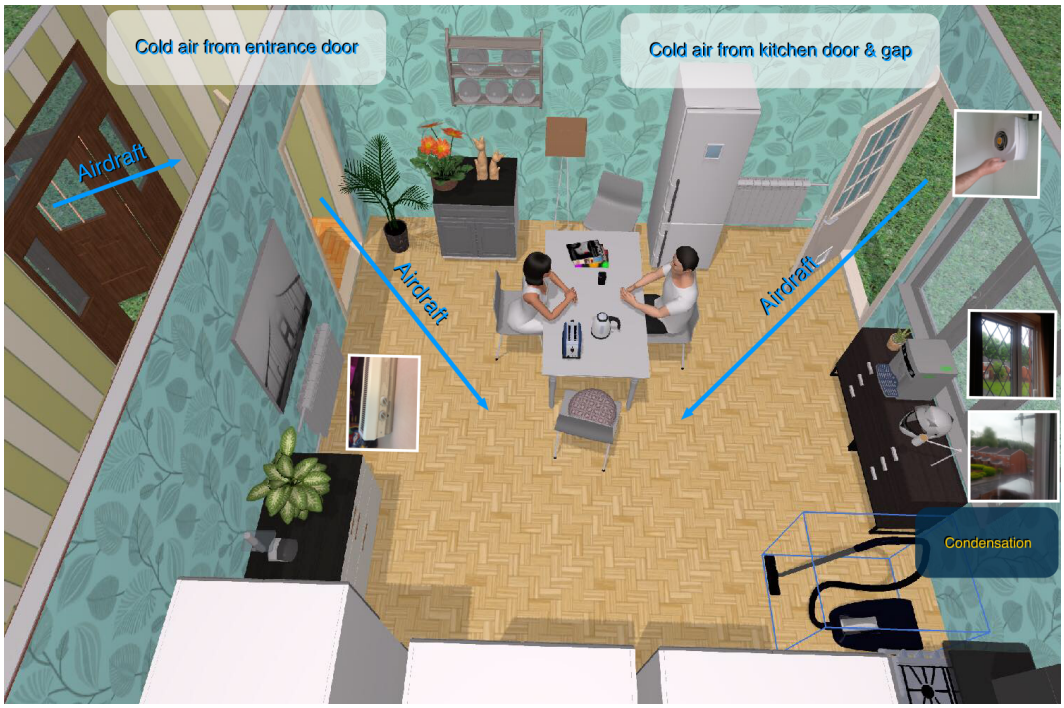
"Humidity is a real problem in summer, not so much in winter".

"The west side is very hot , we close windows and shutters. Hot month are July and August. We have 38° and 90° humidity in summer"

"We use the AC during 2 months in summer, from 6am to 6pm (…) we also use 2 fans"

Increase of electricity bills in summer: +40€ (100 € /2months in summer against 60 € in winter)

"There is 80% humidity is summer, we have a censor"
"The warmth is unacceptable on the west side. In July, August and more and more in June"
"We think of having an AC system to use in winter against humidity"
"We use the humidity dryer 2 months a year, around 3 hours each day (…) we also have 2 fans"
Increase of electricity bills in summer: no (80 € /2 months on average)



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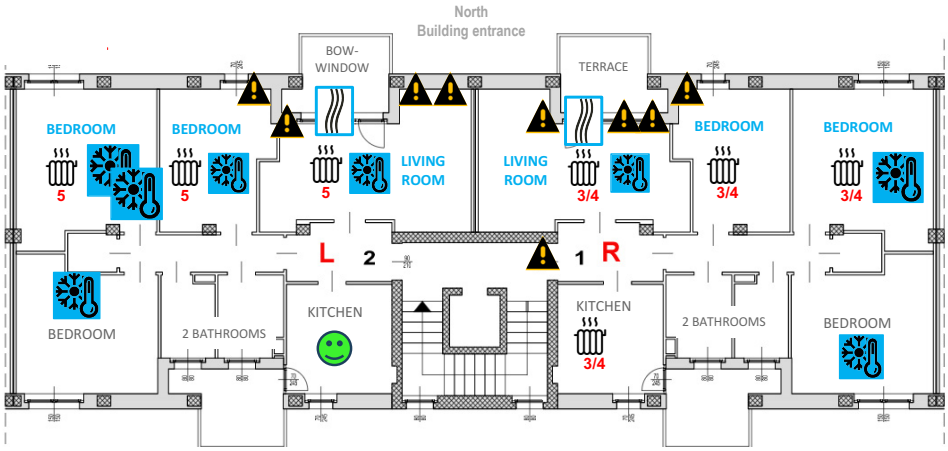
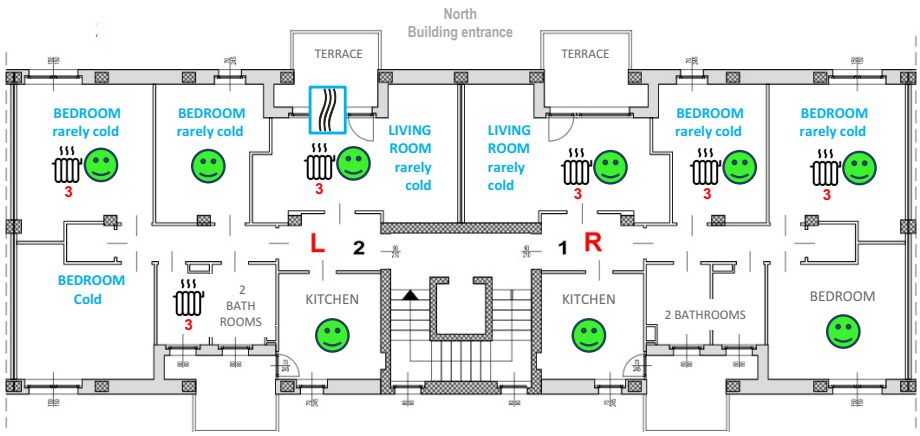
Comparison & mapping before/after renovations: our approach step by step

The objective of this mapping is to visualize easily the differences of tenants' life quality and thermal comfort before and after the DREEAM renovations:

- ⇒ Step 1: Interview inside home with tenants with a detailed guideline
- ⇒ Step 2: Analysis grid + Full Report (deliverable 4.2b)
- ⇒ Step 3: Mapping
- ⇒ Step 4: Interaction Plan and Engagement Program with tenants
- ⇒ Step 5: Follow-up interviews after renovations with the same group of tenants
- ⇒ Step 6: Analysis grid + Full report (Deliverable 4.8 Final analysis on the tenants' engagement and communications strategies)
- ⇒ Step 7: Mapping before/after renovations & assessment of tenants' final satisfaction with DREEAM approach & renovations.



Example of the mapping before/after renovations in 2019 of tenant's thermal comfort & heat consumption

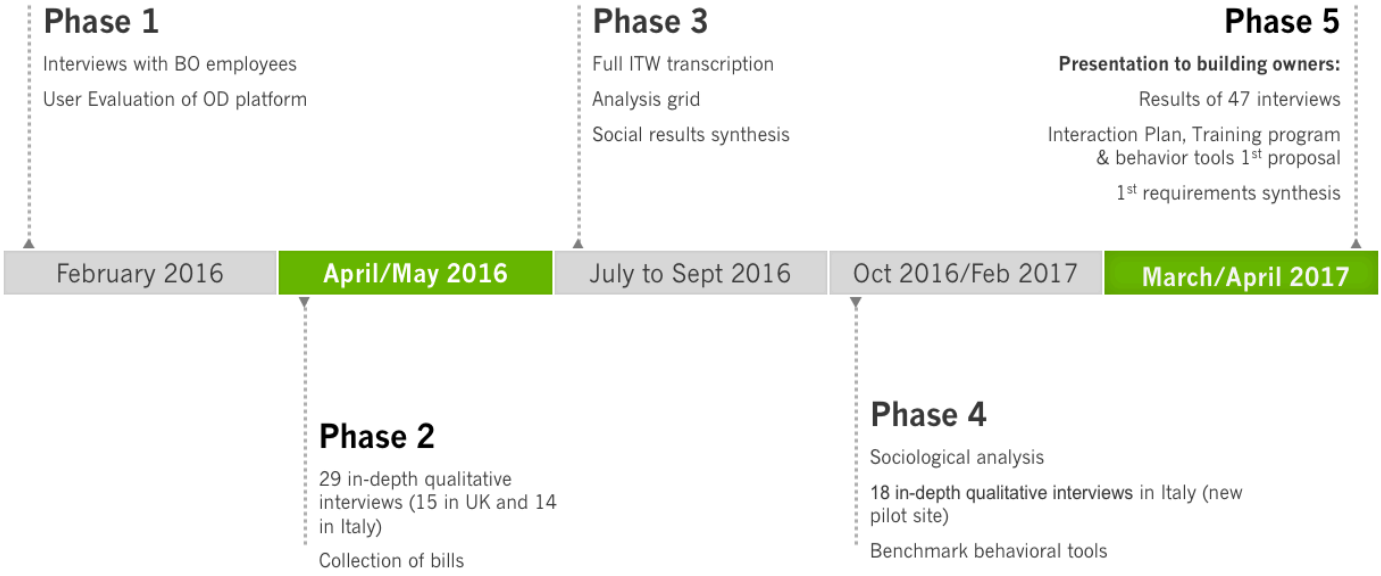


1.3 STEP 3: the development of a training program to inform tenants about the renovations performed in the DREEAM project & to teach them how to use the new technologies appropriately

Behavioral tools and engagement program examples will be presented by middle of 2017 to building owners from previous successful projects, and discussed in the perspectives of the detailed results obtained from the sociological survey presented in the deliverable 4.4..
From the results of the interviews, the WP4 partners will build an Interaction Plan & a Training Program for the tenants after the renovation that will focus on energy efficient behaviors: teach to tenants the appropriate use of newly installed equipment to avoid the decrease of energy efficiency related to behaviors;
The training program will focus on avoiding the misuses of new equipment and anticipate the risk of "rebound effect" with an adequate information program.
The risk for several employees of BO in the DREEAM project is indeed that for tenants, the thermal comfort is important and the pilot houses and dwellings are cold. So tenants may increase the use of radiators in their homes once they can afford to do so after the renovations, in order to reach a high level of comfort with really "warm" rooms.
We have indeed started to observe such behaviors in the 2nd Italy Pilot site, where tenants who can afford to use the heating option of their AC device in winter, simply use it in addition to their use of the other radiators in the dwelling. The goal of this attitude is to reach a higher level of comfort, as the radiators only allow tenants to reach a level that is not discomfortable, not "cold" but not yet "warm" and comfortable". Classically in the field of thermal comfort perception, the various distinction of tenants between their different level of perceptions are very important and need to be studied in detail to understand the level of thermal comfort in a dwelling. The "rebound effect" is an important qualitative indicator that we will integrate in the final measurement & assessment of the energy efficiency post-renovations (not only quantitative indicators related to energy consumption of dwellings & tenants, but also qualitative indicators to understand if tenants' behaviors have stayed similar or if they have changed in a positive or negative way/meaning towards more energy savings or less energy savings than before renovations).

STEP4: the follow-up in-depth analysis of tenants' life conditions and energy consumption patterns after the renovations & also the analysis of tenants' satisfaction with DREEAM project process and the impact on their life quality.

2 The timeline of sociological & User Experience evaluation during the Period 1



3 Methodology to select the corpus of interviewed tenants & guideline of questions

3.1 The selection of a limited number of tenants to interview for qualitative interviews

In the beginning of 2016 and 2017, SinCeO2 and SAVILLS have interviewed the local manager of PFP and ATER to determine the key technical and social characteristics of the dwellings and the households living in the pilot buildings.
Based on the concept of **qualitative representativeness and the answers of the local managers**, we have identified the key criteria and the technical and social archetypes of each pilot site: the various but most typical characteristics existing in the entire pilot site, that we should also include in our limited corpus of households who will be interviewed and monitored in the project.

3.1.1 Qualitative representativeness selection

The "qualitative representativeness" selection is based on the socio-anthropological approach where we try to build the most various corpus possible by mixing the characteristics, representations and practices of the individuals who are selected for interviews. The goal is to build a corpus of selected individuals that represent trustfully the diversity of the different individuals and profiles of our field study. This qualitative representativeness and selection process can be adopted in researches in the field of sociology of consumption, as it revealed to be an efficient approach to cover with a limited number of individuals, the wider diversity of values, attitudes and practices existing in a bigger group. The experience in sociology of consumption shows indeed that the representations, values, attitudes and behaviors of individuals are not unlimited but at the contrary can be very similar, and repetitive in specific archetypal groups. For example, in the field of sociology of energy consumption, we classically find groups of individuals who are "sceptic", "neutral", "newly adopters of saving behaviors", "eco-friendly", who share quite similar cultural representations, social norms, domestic routines and consumption practices.

3.1.2 The 2 steps of tenants' selection with local building managers

After a 1st selection of tenants, SinCeO2 and SAVILLS have presented to PFP and ATER their synthesis of the dwellings' criteria and the 1st selection of tenants to interview and monitor based on a mix of social and technical criteria.
Then we have organized several exchanges with PFP and ATER at the beginning of 2016 and also in 2017 to check the 1st selection of households and to establish the final list of tenants in each group (interviewed group & monitored group).

This step also allowed partners to check the evolution of the occupancy profiles in our selected corpus of households in the next years. Indeed, the evolution of dwellings' occupancy is a key

factor to track in the energy data collection BEFORE/AFTER the renovations, so we have tried to identify if some tenants were expected to move-out soon and the tenants who recently moved in. In our current selection: only 1 tenant has recently moved-in in the UK pilot site, but this tenant was previously living in the pilot site and in the same block of dwellings. For the project, we should be able to collect the bills of this tenants in the new apartment for an entire year before any renovations (January 2016 to January 2017) and the bills from her former apartment in the previous 2 years (yearly statement) so we can integrate this tenant in our analysis BEFORE/AFTER renovations.

3.2 Corpus of interviewed and monitored households in the PFP pilot site

In our collaboration with PFP employees, we have finalized at the beginning of 2016 the selection of the households to interview and the households to monitor:

- 15 households in total have been interviewed;
- 9 households have been selected to be monitored inside the group of the 15 households interviewed.

The objective of this selection is to have for a specific group of households both:

- **In-depth qualitative data** about their consumption patterns and their life quality (qualitative interviews);
- **Quantitative data** with bills collection to follow finely the evolution of their energy consumption during all the duration of the project and before/after renovation (monitoring equipment).

This specific group of 9 monitored households especially should give us very valuable and detailed data to:

- measure the satisfaction of tenants with the DREEAM project;
- measure the evolution of their dwelling's energy consumption;
- establish the evolution of their own behaviors before/after the training program (a program dedicated to tenants, in order to learn them how to use new refurbished dwelling and new equipment).

3.2.1 Process of interviews with tenants and PFP employees in 2016

15 households interviewed in May 2016 inside their homes in Padiham during 1 hour
These interviews have been very efficiently prepared and managed by PFP team:

- Before the start of each interview, a PFP employee explained again to the tenants the goal of the DREEAM project and the objective of the sociological interviews, as well as their rights related to the personal data that we collect during interviews;

- Tenants were given the possibility to refuse of course and to ask any questions to the PFP employee and the sociologist before the start of the interview;
- Then each interview lasted 1 hour and has been performed inside the apartment of the tenants, allowing to question tenants on their domestic uses *in situ* with direct demonstrations of their interactions with equipment such as radiators, thermostats, electric shower. The interviews were performed in presence of the sociologist of Savills and one PFP employee;
- At the end of each interview, tenants were given a consent letter and the possibility to ask questions again about the interview, and the consent form that there were asked to sign.

3.2.2 Synthesis of the 15 households interviewed in UK

Number of households interviewed	**15**
Total number of tenants living in the households interviewed (adults and children included)	**31 tenants**
Number of adults aged from 24 years to 90 years old in our corpus of interviewed households	**22 tenants**
Number of youth or children from 0 to 24 years old in our corpus.	**9 children or young adults**

3.2.3 Synthesis of the 18 households interviewed in the 2nd pilot site in Italy

In the beginning of 2017, Savills organized an interview with ATER project manager and the local building manager of the Tower A & B to establish the social context and the key characteristics of the tenants living in the new pilot site. Based on this interview, SinCeO2 and SAVILLS have listed the technical and social archetypes of the households to select in our qualitative survey, in order to build a relevant corpus with a good qualitative representativeness of the entire pilot site.

On the 18 households of the Tower A and the 18 households of the Tower B, according to the description given by the local manager, our corpus had to be composed with the variety of following household structures to be well representative:

- Couple of elderly people without children
- Younger couples with a young child
- Couples with elderly children
- Few people living alone

In total 18 households composed with 46 tenants have been visited and interviewed.
In total, our qualitative survey integrates 50% of the 36 households in the 2nd pilot site with 18 households interviewed.

Number of households interviewed	**18** 9 households in building A 9 households in building B
Total number of tenants living in the households interviewed (adults and children included)	**46 tenants** **19 men and 27 women**
Number of adults aged more than 24 years old in our corpus of interviewed households	**39**
Number of tenants under 24 years in our corpus	**7**

3.3 The qualitative interview with a semi-directive guideline of questions

Our methodology to collect the data comes from the field of sociology of consumption and habits: qualitative face to face interviews with tenants by following a semi-directive guideline of questions (a list of pre-determined questions is prepared before the interviews, the sociologist follows this guideline but the answers are not closed/controlled/stopped by the sociologist, tenants are encouraged to answer to each questions but they can also explain their opinion and practices on other topics if they want).

3.3.1 Presentation of our semi-directive guideline of questions and our social indicators

We have developed a rigorous and ambitious sociological enquiry thanks to in-depth face-to-face qualitative interviews with both building owners' employees and with tenants. The guidelines were prepared prior to interviews to cover efficiently a various range of topics.

For the interviews with tenants we have built a set of indicators specifically designed for the sociological analysis of tenants' energy consumption:

1. **Detailed mapping of the life quality of tenants inside their dwellings and thermal comfort.**
   - Difference of temperature and thermal comfort feeling between the different rooms/orientations/floors;
   - Humidity perception;

- Presence of damp, mould & condensation;
- Air velocity and air leaks;
- Local wind orientation;

2. Patterns of presence inside the dwellings.

In our guideline used during the interviews with tenants, we have integrated indicators related to the wake-up time and the periods of the day where tenants are at home and when they use the most and the less their various domestic appliances, and their heating system, in order to build 2 additional relevant social indicators to our sociological evaluation strategy before renovations.

These 2 social indicators are:

1. "Full time dwelling occupancy": for the full-time presence at home of at least 1 tenant;
2. "Domestic cycles indicator": for the time patterns of presence inside the dwelling.

Value of these 2 indicators for the social and statistical analysis

These 2 indicators allow to establish the daily cycles of energy consumption inside the dwellings, and the situations of high heat demand & thermal comfort priority for tenants who stay at home most of the day (such as retired tenants or unemployed tenants). These 2 indicators also allow to determine opportunities for energy load models with peak-demand, off-peak demand periods, time-related consumption habits and opportunities of Demand Respond scenarios.

For tenants with low income level, this indicator is particularly important to check as the tenants will experience 2 co-dependent issues: fuel poverty and low thermal comfort that are conjointly increased by the high presence at home. The category of tenants staying at home must on average heat their dwelling 8 hours more than an active tenant.

Some families simply can't afford to heat all day long and we have noticed 2 situations where housewives were settling the minimum of heat during the day, until the return of their child in the afternoon, when they would release the temperature to ensure that the thermal comfort is good for their child. As an employee of PFP mentioned during our interviews, renovating Padiham is an important matter to allow many tenants to access to a decent comfort standard while avoiding a situation of self-deprivation. This category of tenants has been integrated in priority in the monitored group in UK to identify the best equipment and advises that can lead to a better management of their energy budget. In Italy, we also tried to identify the key thermal comfort issues and the households staying inside their dwellings most of the day, and the impact on their life quality.

3. User experience of the equipment to heat the dwelling (like the complicated storage heater in UK), and user experience of equipment for the domestic hot water.

We have studied the micro-practices of tenants inside their domestic space with energy related equipment. For example in UK, our interviews allowed us to understand that the pre-payment meter symbolizes for tenants an efficient energy control tool and an indirect energy consumption feed-back, in a context where no other tools are given to customers to really control their consumption and to fix budget limits.

4. **Also to be able to establish a statement of fuel poverty in UK, and in the Italian pilot site we have collected mixed quantitative and qualitative data:**
   - We have collected the bills of tenants for the heating and electricity or gas consumption;
   - We have exchanged with them during interviews on their potential difficulties to pay the energy bills;
   - We have used the qualitative indicators promulgated in the final report of the EPEE project to detect fuel poverty that we integrated in our interview guideline (European fuel Poverty and Energy Efficiency project /Intelligent Energy Europe)[3]
   - The indicators underlying a potential fuel poverty situation are (non exhaustive list): budget dedicated by the households to the electricity, heating & water; self-restriction of appliances or heat use, "ideal budget" for energy expenses and comparison with the real budget spent, presence of damp, mould & health issues related to the difficulty to heat or to cool in summer;

For the majority of households in our corpus, tenants experiment self-restrictions to use energy and many are in situation of fuel poverty if we refer to the particular definition established in the UK: *"a household is in a situation of fuel poverty when it has to spend more than 10% of its income on all domestic fuel use, including appliances, to heat the home to a level sufficient for health and comfort".* An official definition of fuel poverty is not yet set out in the EU and there is a need to *"define common indicators and relevant quantitative data to characterize on a same basis the situation in the different countries" (European fuel Poverty and Energy Efficiency/Intelligent Energy Europe)*[4]. If we take into consideration the official UK definition of fuel poverty and also additional indicators listed by the EPEE, we can state that some tenants in the UK and Italy pilot sites are in an even higher fuel poverty, with 10% to an estimated 20% (during particular months) of their income used for their domestic fuel use (all included), with a particular high cost linked to the storage heater equipment in winter in UK, to the individual heating in Italy, and the use of AC systems in summers during heat waves in Italy.

In the interview guideline we have also integrated:

5. **The list of urgent renovations expected by tenants and current satisfaction level about the dwelling;**
6. **Questions for tenants related to the socio-economical context in the pilot site:** relations and trust with the building owner & the local building manager, interactions phenomena between tenants especially if "natural referent tenants" help other tenants to understand their equipment & their energy bills.

[3] Référence : https://ec.europa.eu/intelligent/projects/en/projects/epee
[4] Ibidem

3.3.2 Detailed guideline of interviews for the UK Pilot site (the guideline was similar for the Italy pilot site except little adaptations to the local equipment

BEFORE STARTING THE INTERVIEW

1. Deliver to each tenant interviewed a document presenting shortly the project, the type of data we will collect during the meeting and how we will later use and protect these data
2. Ask the consent of tenants or not to record the interview for accuracy of later analysis (we can't note directly/in live everything tenants answer);
3. In case we need to take pictures inside the apartment, partners must ask the official consent of tenants before (for example to show the presence of mold, humidity, cold zones);
4. Let the tenants read this document while answering to questions if needed;
5. Only start the interview once tenants have agreed to the conditions mentioned.

Purpose of interviews in the context of the DREEAM project

- Understand the current life quality of tenants and their energy and water consumption patterns
- Establish their needs for renovations and new equipment
- Identify positive elements to elaborate the interaction plan to inform tenants during the project and the training program to help them later to use efficiently the new technologies/equipment installed
- Other households in the area will be questioned to identify key facts about life quality of tenants

Use of personal data and anonymization

⇒ The name and address of households won't be integrated in any report presenting the result of interviews (both working document, public and confidential reports)

⇒ Personal data collected during interviews will be anonymized in all documents and reports produced on the basis of interviews results;

- Age, gender, household structure, activity will only be used anonymously for statistical purpose (global statistics on tenants in the buildings) and to identify potential correlations between gender, age, household structure and energy consumption patterns, and renovation expectations

Personal data collection not allowing to identify tenants easily

⇒ The report presenting other personal information (consumption patterns, equipment owned, occupancy of the dwelling, opinions, expectations for renovations) will also by anonymized.

⇒ The opinions of tenants will be used in anonymous quotations in public and confidential reports in order to illustrate the sociological analysis of interviews with real and direct answers of tenants.

⇒ The interview will be audio-recorded but with no mention of the name of tenants, the audio-record is submitted to your consent before the start of interviews

General information

Household's structure (individuals living full time in the dwelling):

- **Are you living here alone or with someone ? Do you have children?**

❑ Single
❑ Couple without children
❑ Couple with children (2 or less)
❑ Couple with children (3 or more)
❑ Single parent with children (2 or less)
❑ Single parent with children (3 or more

Age (for households with multiple tenants, ask the age of the other family members)

- **How old the persons living in the dwelling ?**

❑ aged 15 to 24 years
❑ aged 25 to 39 years
❑ aged 40 to 54 years
❑ aged 55 to 64 years
❑ 65 to 74 years
❑ 75 to 84 years
❑ Up to 85 years

The age groups are taken from EUROBAROMETER. They may differ from national statistics

- **Gender of the occupants**

❑ Male: number of occupants
❑ Female: number occupant

Electricity and water equipment in the dwelling & uses

- Can you describe us a normal day of living in your apartment, and to be more precise when and why you use equipment consuming electricity or water in your dwelling? Ideally from the morning to the night by listing the type of equipment you use? The goal is to identify the moments of big or low consumption in your dwelling.
- Can we start with electricity, heating and then water ?
- During the week-end, is there any important difference that we should know in your habits?
- Can you list the other equipment using electricity of water that you use each week but not on a daily basis ?

If the description is not clear enough: How many showers/baths do all the tenants in your apartment take each day ? /or each week ?

Saving practices/habits

- Do you try to be careful and to control your consumption, like to use less electricity sometimes or less water ? Can you give me examples?
- Why are you interested to consume less electricity or water? (education, culture, environment, budget ?)
- In your budget or costs, what do the electricity bills represent ? Is it too much ? How much would be a decent/normal cost per month for all electricity consumption ?

- How do you concretely top-up your meter and how often?
- Do you receive enough details by your supplier about the link between your top-up level and the level of energy your receive for the amount ?
- Does the electricity price increases or decreases since few years according to you ?
- Would you like to receive personalized advises to make electricity savings and to receive ideas to control your consumption and to know better the level of consumption of certain devices ?
- Do you discuss sometimes with neighbors or relatives about the cost of electricity or about the cost of charges ? For example to understand/or compare the costs ?
- Do you think that systems like radiator timers and water mitiger could be a good idea to lower the electricity consumption ?

If these topics haven't been mentioned before, ask the following questions:

- Do you have low consumption bulbs or led bulbs?
- Do you own low consumption electric equipment like A category and more ? (high energy efficiency)

Mapping thermal comfort in winter

- Are there rooms/spaces where you feel more warm in your apartment in winter?
- At the contrary, do you feel that some rooms and areas of the apartment are really more cold or feel less comfortable in winter ?
- Can you detail why you feel less comfortable ?
  Factors of comfort or discomfort in winter to identify clearly with tenants and to spot on the dwelling map: temperature, air velocity, humidity, lack of light, leaks around specific areas (windows, doors, ventilation holes) and other factors if existing.
- Usually what are you doing when you feel cold in these spaces/areas ? (reading, cooking, watching TV, etc) *(we try to identify the activity of tenants during the low thermal comfort and what these activities represent in the everyday life of tenants / level of disturbances for them)*

Use of radiators

- How does your heating system work?
  (Identify the level of knowledge of tenants and the optimization or not of the equipment's use/Turn it on, turn it off, re-pressurize, bleed radiators - Economy 7)
- Do you understand why your system works this way or you would like advices to optimize its use and function?
- Did you receive a booklet explaining how the heat storage system works ? Would you like to have one ?
- Personally when during the year do you start usually to open radiators, when do you stop? *(which criteria/ it's not necessarily correlated to the temperature inside for tenants)*
- What are the radiators that you use during winter in general and in which rooms ?
- Do you let certain radiators open all the time ? Why and where ?
- Do you close some radiators during long hours ? Like during the night or in un-used rooms or when you leave the apartment ?
- Are there radiators that you never use ? Why and where are they ?

- Do you put a different temperatures / set points between the different radiators/rooms ?
- Have you ever had to open windows because it was getting too warm ?
- Do you aerate often your apartment (open the windows) in winter and how long ? Do you close the radiators when you ventilate or not ?
- Do you use any anti-humidity equipment? How often (how many days per year) ?
- Do you know the temperature you usually have in your apartment ?

Extra-consumption due to lack of thermal comfort

- Do you use an additional source of heating to feel comfortable like an electric little radiator in winter sometimes ?
- If yes : what is the equipment electric power you have ?
- How many hours do you use it on average ? Is it expensive to use this device ?

Mapping comfort in summer

- Is there enough sun in your apartment in summer or it's dark ?
- Do you ever experience days when the warmth is too high in summer or never ?
- At the contrary do you experience to feel cold in your apartment sometimes even in summer ?
- Does your apartment feel comfortable with the inside temperature and humidity level ? When in the year does you apartment start to feel comfortable and when does it stop ?
- Do you have to use extra heating system like electric radiator sometimes during spring, summer or beginning of autumn ?

Comfort in collective spaces and future renovations

Expectations and future renovations

- Are they collective space / areas for you and the other neighbor ?
- What are the equipment or renovations we should do in priority according to you to improve the comfort of your dwelling specifically ?
- Would you be happy that renovations would be made in your apartment ?
- Have you already experienced renovations in the past ? What are the positive or negative memories you have and why ?
- How do you expect to be informed before and during the future renovations here ?

Understanding of energy efficiency, green buildings

- Do you have friends or relatives who live in newly renovated apartments, or house with high energy efficiency level ? What type of equipments or renovations do they have ?
- Or have you heard about more energy efficient buildings or green buildings ? Do you know how they work ?
- If we had to give advises to tenants about how to use new equipment, new heating systems for example, how do you think we should do ? With collective meetings ? Personalized diagnostic at home to explain to each person ? By letter ? Leaflet ? Poster ?

- Do you think that in the future, we should try to involve tenants to help or inform other tenants to use new equipment ? Or do you think that information should be done only by experts like energy coaching or PFP employees ?
- Do you think it's positive or un-necessary that we come to question you in order to understand your life comfort in the dwelling ? Would you agree to be questioned again later in several months ?

Collective life

- Do you know a lot of your neighbors ?
- Do you have collective events sometimes ? Or collective meetings between tenants ?
- Do you have a tenants' association ? Do you participate in the tenants association ?
- Do the tenants association helps tenants to get information about the building, the charges?

Life in the building

- How long have you been living in the building ?
- Have you lived in another apartment of this same building before ? Have you noticed a difference of comfort, quality between them too ?
- Have you lived somewhere else before ? In another type of habitation ?
- Does this apartment is more or less comfortable than your previous habitations ? (thermal comfort, quality of the building/the dwelling)

AFTER THE INTERVIEW

1. Ask to tenants if some information they gave during interviews should be kept off or not mentioned even anonymously in public reports;
2. Ask to tenants if after the interview they confirm and sign the consent that we use anonymously the information and pictures taken during the interview;
3. Let tenants sign the consent;

OPTIONAL:

Ask if tenants accept to be pictured publicly for reports, newsletters, articles, websites about the DREEAM project.

3.4 Protection of personal data collected with tenants

3.4.1 Privacy Policy

In accordance with the European laws on privacy (Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation):

- We have carefully informed tenants about the project and their rights regarding the personal data that we collect during interviews & how we will use these data anonymously;
- We have given to each household interviewed a consent letter to sign during the interview;
- We have informed tenants before the start of the interviews that personal data provided during the interviews will be analysed and reported anonymously, with a code assigned to each household. We have also asked if some tenants would accept to be quoted in person/not anonymously which some tenants accepted. Though by measure of equity and personal data protection, in all our reports, we refer to tenants' quotations by using only a code assigned to each household, never a name;
- We also asked to tenants if they would accept to be taken in pictures or videos to promote the work done in the DREEAM project. Several tenants accepted and we integrate to this report several pictures taken with the signed agreement of tenants during the 2nd survey in the Italy pilot site;
- We also informed tenants that they could request to leave the project at any time.

3.4.2 Social data collected during interviews

The document to inform tenants about the interviews, and the data protection policy in the project have been prepared in collaboration with PFP, ATER, SinCeO2, Chalmers and SAVILLS. These documents have been validated by PFP and ATER, and are aligned both on the UK data protection act, PFP data protection policy, Italy data protection act, ATER data protection policy as well as best practices promulgated by the EC in research projects.

The housing companies delegated an employee to assist the sociologist during interviews to make the translation of tenants' answers (Italian to English), this building owners' employee was asked to translate the more accurately and in direct during interviews the answers given by tenants. The employee translating the answers of tenants to the sociologist was responsible for the accuracy of the data translation in English. The audio-recording of interviews is an additional guarantee of transparency about this translation work, and allowed if needed to recheck the content of the interviews during the sociological analysis, in addition to the notes taken during the exchanges with tenants.

3.4.3 The consent letter form explained and signed (yes/no for each affirmation) before the start of each interview in Italy and UK (an Italian version has been created for tenants in Treviso Pilot site)

Consent form for the interviews in the context of the DREEAM project

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I, the undersigned, confirm that (please tick box as appropriate or write no when you refuse)

1.	I have received information about the DREEAM project and I have understood the objectives of the interviews	
2.	I have been given the opportunity to ask questions about the project and my participation in it.	
3.	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reasons.	
4.	The procedure regarding confidentiality have been clearly explained (e.g. use of names, pseudonyms, anonymization of data, etc.) to me.	
5.	The use of the data in research, publications, sharing and archiving has been explained to me.	
6.	I consent to the interview being audio recorded.	
7.	I consent the interview to be video recorded and used in a public video of presentation on the DREEAM project	
8.	I would like to have the energy monitoring equipment installed in my property for the purpose of this project	
9.	I agree for my name to be used publicly in reports, publications and other research outputs	
10.	I agree that pictures of me during the interviews are used publicly in reports, publications and other research outputs	
11.	I, along with the Researcher and the representant of …. (ATER or PFP), agree to sign and date this informed consent form.	

3.5 Interviews with the building owners' employees

In parallel to the definition of the DREEAM approach, Savills' sociologist has performed a sociotechnical analysis based on in-depth qualitative interviews with building owners' local managers and employees. A guideline of question was prepared prior to interviews to cover efficiently a various range of topics.

The detailed interview guideline with building owners' employees has been prepared prior to the interviews with the objective to evaluate the aspects related to:

(1) The objectives & work process, experience in energy renovations, expectations with the DREEAM project, methodology to assess energy efficiency;
(2) The technical implementation (organizational constraints of housing companies, regulatory and financial objectives of organizations and preferences on technology usages);
(3) The process of the building owners company to usually communicate with their tenants, positive & negative experiences, and involvement of the tenants in the decision-making process.

3.6 Achievements during the Period 1 for the sociological evaluation

We have finalized the sociological enquiries in UK and in the 2 pilot sites in Italy (1st and 2nd pilot site). We have performed:

- Group meetings and interviews with 4 employees of each Building Owner, and 2 interviews of the 2 local managers in UK and in Italy;
- In-depth semi-directive interviews with 47 households.

3.6.1 Sociological report/ Deliverable 4.2b

(1) We have finalized a detailed sociological report *(deliverable 4.4)* with a rigorous and exhaustive approach to present the results of our enquiries;
(2) The analysis of BOs employees' interviews has been presented thematically both in the deliverable 4.4 and the deliverable 4.5 *(Requirements of BO for the DREEAM platform).* The analysis of tenants' interviews has been presented with the detailed statistics of each answer per category, with the full tenants' quotations and the impact on the DREEAM project (social risks & opportunities);
(3) We have also established key proposals for the communication tools that we recommend to develop in the Training Program dedicated to tenants before/after the renovations. These proposals will be discussed with the 3 building owners by mid-2017.

3.6.2 Summary of results

(1) **The interview guideline has been efficient and well adapted to our target group:** in 1h to maximum 1H30 with the tenants at their home, we have been able to answer to all the questions of the guideline for the group of 47 households without disturbing the tenants. This positive result allowed to make detailed comparisons between the answers of the different tenants and to establish detailed statistics in our report. Our guideline was also easy to understand for tenants and based on every-day life habits;

(2) **Tenants were all positive with the interviews**, and 46 households on 47 accepted to be interviewed again during the project (1 tenant prefers to not be disturbed in general not only because of DREEAM project);

(3) **We have experienced a successful collaboration to prepare the interviews with building owners in UK and Italy** who have been particularly proactive & efficient during the sociological evaluation process;

(4) **We have an excellent group of tenants in UK and Italy:** tenants are very collaborative, friendly & explicative, they also avoid to under or overestimate their answers /actions and we have gained very valuable information. Many tenants accepted to be integrated in the communication about the project and even not anonymously & to be taken in pictures/videos to share the results from our inquiries. We have excellent perspectives to build an efficient training program with the tenants in UK and Italy;

(5) We have already started to communicate on the results obtained during the interviews in the project:

- EURHONET newsletter on the sociological interviews in Italy written in collaboration with Chalmers;
- Presentation of Savills' sociologist as expert speaker during the World 1st playable conference hosted by the United Nations in the context of SDGs at Bonn World Conference: *"The Global Festival of Ideas for sustainable development".* The intervention took place during the session *"Green economy"* to present the key results of our sociological studies on energy consumption & the DREEAM project.

Many tenants accepted to be integrated in the communication about the DREEAM project. Several tenants also accepted to be taken in pictures/videos to communicate on the results of our sociological inquiries. We have inserted several pictures below of our last sociological survey in the Italy Pilot site in February 2017.

Figure 2: Interview with an Italian couple and the Project Manager of ATER - The interview guideline in English and translated in Italian used during interviews is visible at the 1st Plan

4 Conclusions

4.1 Lessons learned

(1) The thermal comfort is very different depending of the technical characteristics of the dwellings. There is an important injustice especially in Italy between “sandwich floors” and normal floors dwellings;
(2) The air velocity & air drafts, the humidity are key issues in UK and Italy as they decrease drastically the thermal comfort of tenants;
(3) Many tenants are in a situation of fuel poverty to high fuel poverty. We also notice what we call “sporadic/temporary fuel poverty” when tenants who are not economically vulnerable though experience during few weeks each year a difficulty to pay their bills;
(4) We notice a rising phenomenon of “double fuel poverty” issue with increasing energy & water consumptions in winter and now in Summer in Italy with the climate change. Many tenants have difficulties to pay their bills in summer if they own cooling systems or if they have extra-consumption of water due to the heat. The situation of tenants in Italy offers a time perspective of what the inhabitants in more northern latitudes will experience in the coming decades, so their inputs are very valuable;
(5) Some tenants develop specific saving habits and a great solidarity/communication with other tenants to understand how their equipment, energy & water supply work, and how to optimize their uses & decrease their energy expenses. These tenants have excellent budget management skills and could help us to develop an efficient training program for the other tenants especially those in fuel poverty;
(6) Many level of saving margins exist in UK and Italy that we should integrate in our training program: better information & use of low energy tariffs, optimized used of equipment (eco-buttons, low temperatures, use only at full capacity), better budgeting tips, personalized advises on efficient savings, eco-coaching with illustration of the impact of daily saving acts on the energy & water bills.

4.2 Deviations from the DOW

The interviews with the tenants in the Swedish pilot site haven’t been performed due to ASB issues. The employees of Lands have received threats from local tenants in a context where the pilot site area is already experiencing many ASB-Anti Social Behaviors. The interviews have been cancelled by Lands due to this situation.

4.3 Sweden: The reason why it was impossible to organize interviews with tenants

The pilot site experiences issues related to Anti Social Behaviors (ASB). The employees of Landskronahem have received threats from local tenants and this is why the sociological evaluation and interviews before the renovations are not possible to organize in this context. Landskronahem have formally informed the project manager and the WP4 partners that the visits or interviews inside dwellings wouldn't be possible to organize prior to renovations.

In the WP4 we will focus our sociological evaluation for the Swedish pilot site in 2017 and 2018 on:

- **Building a training program for tenants after the renovations to:**
  - Support an appropriate use of the new refurbished dwellings and the new installed equipment;
  - Give advises for tenants and support them to better control their electricity, heating and hot water domestic consumption;
  - This training program will be developed for Landskronahem based on exchanges between Savills, Open Domo, SinCeO2 and the BOs in 2017/2018 and validated by their team in order to be adapted to their objectives & work process;

4.3.1 Propositions for the sociological evaluation in Sweden

The solution we have proposed for the WP4 is to organize interviews post-renovations with a group of tenants who will come to live in the refurbished dwellings. We have established that 2 questions linked to the sociological studies in the DREEAM project are important to answer for Landskronahem in the project:

1. How to evaluate your current tenants' energy consumption habits and life quality?
2. What are the factors that will allow to attract new tenants in the renovated buildings of the DREEAM project?

In this context, the development of social indicators in the process of sociological evaluation is crucial for Landskronahem to understand after the renovations why people will move there in the renovated pilot site and in the new dwellings. These social indicators will be developed to compare the attractiveness of the new area with higher energy standard compared to the old area, and also to understand if specific factors limit the attractiveness of the renovated buildings.

The sociological evaluation in this context could mix indicators related to:

- The evaluation of life quality in individual habitat and in the local urban areas (sociology of consumption & urbanism);

- The sociology of communication: representations of new tenants and targeted customers of the renovated areas, impact of interpersonal relation & the local media cover on these representations, impact of the communication tools developed by Lands on the new renovated area on the perception of habitants.

In the sociological evaluation of the Swedish pilot site post-renovations we could integrate:

- All the social indicators used in the 2 pilot sites in UK and Italy dedicated to the energy consumption and the thermal comfort;
- An additional set of questions related to life quality in the urban area (factors that impact positively and negatively the attractiveness of the renovated buildings area), to the impact of media & the information design on habitants' perception, to the impact of energy efficiency topic on the attractiveness of the renovated dwellings for the new tenants or the targeted tenants.

A holistic set of indicators will be established between Savills and Landskronahem after the renovations in order to interview the new tenants & to understand the factors influencing the attractiveness of the renovated pilot buildings.

The set of indicators proposed to be discussed with Landskronahem in 2017:

- Transport/mobility options, parking lot access;
- Commodities, shops & important services in the closed area;
- Schools and recreational area;
- Security feeling and determinants affecting the security feeling (urban lightning, structure of the buildings, ASB/Anti Social Behavior);
- Reputation of the area and factors affecting it (interpersonal discussions, medias, historical reputation of the area);
- Collective life/dynamic neighbourhood;
- Architecture, dwellings' structure & impact on tenants' satisfaction;
- Energy efficiency and new equipment installed & impact on attractiveness;
- Efficiency of the communication related to the renovated buildings: level of visibility by locals of the information campaign on renovated buildings and impact on perception;
- Attractiveness of the new collective projects linked to Karlslund 2030 global renovation project: attractiveness of urban gardening, local communities, eco-coaching days, etc.;
- Open questions on the unknown potential factors limiting the attractiveness of the area after the renovations that we are unaware of.

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