

Final analysis on housing companies' posture towards the energy efficiency renovations

4.7



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In the current deliverable 4.7 we present:

- In the first part, the methodology to collect the feedback of housing companies about DREEAM renovations (questionnaires and interviews);
- In the second, third and fourth parts, the synthesis of the posture of housing companies towards DREEAM renovations (main conclusions, energy management support expectations, DREEAM approach value, replicability of DREEAM renovations, and other approaches replicable such as the social evaluation).

The current deliverable 4.7 describes the work performed in August and September 2019 in collaboration with housing companies to establish the key positive lessons learned in the DREEAM project, and the replicability potential of the different approaches developed in the project.

This deliverable is coordinated by Savills and involved the contributions of PFP, ATER, 1892.



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1 Method of data collection

This deliverable is the synthesis of the data collected during the months of August and September 2019 in the DREEAM project with the housing companies PFP, ATER and 1892.

To elaborate this deliverable, three methods of data collection have been used:

- An online questionnaire filled by each housing company with a part dedicated to the evaluation of the DREEAM renovations, covering the energy performance, the ROI and the future replication strategies;
- The analysis made by housing companies as presented in their final presentations made during the conclusive conference in Berlin. Some parts of these key conclusions have been integrated in this report as they offer very valuable lessons learned for future projects and teams on how to replicate the DREEAM approach;
- One semi-guide qualitative interview: Savills' sociologist performed one conclusive interview with the housing company teams to collect additional feedbacks for this deliverable.

The analysis of the data collected with these three methods is presented synthetically in this deliverable.



2.1 Main conclusions on the impact of DREEAM approach and renovations

The DREEAM approach has helped PFP to begin developing financial models to ensure they can complete similar renovation projects in the future within budget constraints.

What was missing in the innovation technologies catalogue were the costs associated that are important for PFP, and one expectation for the future with the DREEAM approach is to have more elaborated innovations and synergies between technologies. The synergy aspect of DREEAM approach is not well perceived at the moment as an added value.

The methodology used in the UK to evaluate energy renovations is called SAP, the link between this method of calculation and the DREEAM scenario was complex as there were initially misunderstandings about the SAP calculations.

One lesson learned for future projects is the amount of information that needs to be collected for the DREEAM approach about U value, measurements, etc.. The team of PFP expressed that they were overwhelmed to have to collect so much data that they didn't have at the beginning of the project, they were struggling to get the technical inspection resource and all the data needed.

Now PFP knows more about the added value of data collection at the beginning of deep renovation projects and views it more positively. The PFP team understands now why so much data was needed both for DREEAM scenario generation and for the development of the energy performance baseline, in the future they will collect more data. It was a complicated exercise but a positive lesson for PFP.

In the UK, the general feeling now is to switch away from fossil fuel where possible. Four years ago, the trend was more about gas and now after DREEAM project, PFP has also moved on from fossil fuel.

Thanks to the DREEAM project, PFP has more confidence in installing PV as the project has proven that PV makes sense for PFP in terms of performance, even if there was some scepticism at the beginning of the project because of the UK weather and because of few experiences of PV implementation.

PFP also put a new type of glazing in the DREEAM project, a technology that was a bold step for PFP. This technology is in conclusion very positive, efficient and looks nice on the properties, it is very efficient and now PFP can move on by replicating this technology.

Also the new ventilation system is a success, there is no more damp, PFP could replicate it too.

2.2 Energy management support

The housing company does not use software to manage the services related to energy and consumption. They feel more comfortable using the traditional way of comparing consumptions between years manually rather than using software. They have no automatic data collection and it is challenging for them to track projects and their results.



They don't know the overall consumption in their building portfolio, but they work towards an EPC rating of C when renovating properties.

2.3 Interest for energy data collection

The management of utilities can lead to cost reduction. The most relevant information to collect for building portfolio managers are property condition data i.e. age and structure of windows, roofs etc.

2.4 Tenants' interest for online energy consumption access

The approach taken will determine if tenants are accepting of the changes. If the changes benefit tenants then resistance will be reduced, potential savings/losses depending on how much is spent is a key incentive for tenants. According to the PFP team many tenants would like to have access to software or a service to see their consumption. This type of service would need some work to be done to educate tenants and to ensure certain tenant groups aren't excluded i.e. older tenants who don't access the internet.

2.5 Analysis of energy performance post-renovations in DREEAM project

Verbal feedback has been requested from customers and EPC assessments have also been completed on the properties.

2.6 Main conclusions about the ROI of the DREEAM renovations

Savings are all passed to customer presently. To have a sustainable renovation model, some of the savings must be captured to pay for capital expenditure.

The saving doesn't directly benefit the housing company but rather the tenants. As landlords PFP don't get money back from the savings. But PFP have improved the energy performance, and their team hopes that lower energy costs reduce the risk of rent defaults and reduce tenant turn-over and give a better quality of life for tenants. The economic benefits of the DREEAM renovations for landlords (or indeed any renovation) are indirect whereas the economic benefits to tenants are direct.

It is the first time that PFP have had detailed data on energy performance and analysis after renovations, in previous projects PFP just had rough data. What they found in previous projects was that in their calculation of interventions performance, they could notice over consumptions and they supposed that it was due to the rebound effect. Now thanks to the methodology elaborated in the WP4 in collaboration between Sinceo2 and Savills, it has been possible to quantify the rebound effect in a series of households that over consumed after the end of renovations. This is something new and very valuable as rebound effects have only just started to be quantified, it is a new topic, and it is very interesting for PFP to see the numbers in the analysis that quantifies potential rebound effect. The PFP



teams agrees with the Savills' sociologist proposition to check with tenants and with the help of PFP's social worker how the behaviours have changed after the end of renovations and how this explains the rebound effect situations illustrated in the final analysis of Sinceo2. This investigation will be performed after the end of DREEAM project.

PFP need KPIs to qualify the success of energy renovations for tenants. Rebound effect is one crucial KPI and this method with inside temperature monitoring and energy consumption is useful to identify over-consumption of heating and the degree of rebound effect. The PFP team has never seen this kind of analysis before with concrete numbers and graphs linked to rebound effect, it is a good method. PFP understands the importance of real-data monitored in the dwellings before renovations and after renovations for the historical comparison.

2.7 Replicability of the DREEAM renovations in other similar building portfolios

Depending on the financial model implemented then it could be attractive to replicate the DREEAM approach selected for Padiham pilot site. At present however no aspects of the project are being replicated.

PFP's ROI is calculated with multiple parameters for each property: repairing costs, complaints and interventions costs, performance analysis for the total repair costs, void loss when someone leaves the property, and the turn-over cost. Now the PFP team should share these numbers to stimulate a debate with their colleagues. They will share the analysis and deliverables with a colleague who is expert in data analysis and modelling. What PFP does now it is to calculate what they have spent per property and they have a dashboard to visualize the property with a code from green, orange to red to see how a property is doing and what is the economic performance for each property.

For future replication, PFP intends to:

- Create a designated project team Including all stakeholders;
- Pre –evaluate and carry out full energy efficiency performance assessment prior to specification;

Overall, according to PFP, housing companies need to get closer to the provision of heat and hot water, in order to carry out future upscaling of retrofit by sharing the cost benefits of energy reduction. This represents a major shift in business model for the housing companies.



2.8 Other approach learned in DREEAM project to replicate in the future projects

The social dimension of the analysis developed by Savills' sociologist has been a positive lesson learned and PFP intends to replicate the following aspects:

- Involve customers (tenants) at the earliest opportunity of the refurbishment including co design of the projects;
- Post-evaluation: carry out full customer survey Including energy consumption data and thermal comfort after heat season;
- Capture the wider benefits energy efficiency interventions bring to the community.

2.9 Analysis post-renovations

What type of analysis are you the most interested in to quantify the impact of DREEAM project on your ROI to determine the replicability potential?

PFP: "Consumption comparisons - pre versus post. evidence of rebound effect and changes in internal temperatures pre and post renovations".

Quantifying indirect benefits of renovations such as the decrease in turn-over

PFP: "How to quantify the cost of turn over? We could indeed quantify the indirect effects of DREEAM renovations and the economic performance before in 2015/2016 and after in 2019. Now, the property is calm, from the social worker's point of view, we have less complains on the estate and the neighbours, we got only one repair complain during our last visit, overall, we don't have much contact with consumers because they are fewer complains and interventions needed compared to before. So the overall cost of interventions on the estate is probably lower thanks to DREEAM renovations. We did a supervision checking lately on the estate in Padiham, and we found very little defect, there was no issues from tenants, so there are very little interventions requested compared to before. We will check how much interventions and complains interventions there was in 2015 and in 2016 before renovations. The overall perception of DREEAM renovations is very positive and will lead to the replication of the DREEAM approach in other pilots of PFP with successfully tested technologies during the projects such as the PV, the new windows, isolation and ventilation".



3 1892 – Nettelbeckplatz Pilot site – Berlin



3.1 Main conclusions about the financial impact of DREEAM renovations

The financial data is not measurable exactly but the experience for 1892's internal DREEAM team of working in the European DREEAM Project was a very good one. In addition to their tenants' engagement and information, the see an added value in the individual tenant interviews. For 1892 employees it is a motivation to work together with a multinational team.

The business of 1892 is regionally limited and this project is a great opportunity to think outside the box.

3.2 Energy management support

1892 do not think software would help, as everything runs on paper. It is challenging to integrate other tools and such a software is not easy to use. 1892 has no time for managing software for energy management. 1892 have all the necessary information per building/dwelling and don't need an energy management software.

Are you thinking of taking new responsibilities in the future to manage energy, water or gas?

1892: "Yes for electricity for e-cars and PV-Production".



3.3 Tenants interest for energy consumption access

Do you think your tenants would appreciate that your company takes more responsibility in the future for the management and distribution of energy - such as for example by installing and managing PV production for the benefit of tenants - and why?

1892: "Yes, they would because of their benefit (price). Tenants would be particularly interested by the following information: 1. Duration of the modernisation 2. Time schedule of the modernisation 3. Price increase after renovation 4. Price decrease of Energy 5. reduction of energy".

3.4 Analysis of energy performance post-renovations in DREEAM project

1892 portfolio: on average 106 kWh/m²/ per year for heating in 2016 and after DREEAM in 2018: 91.47 kWh/m² per year. Most gas heating systems are tenant owned. Almost 100 % of the buildings have district heating.

1892 make energy analysis on a yearly basis. Due to the renovation period in 2018, they will analyse and compare the data of 2017 with the data of 2019 and 2020.



Figure 1 - International cooperation between DREEAM team and 1892 in the Berlin Pilot site

What are your main conclusions about the ROI of the DREEAM renovations?

1892: "The Project was too complicated to calculate the ROI".



3.5 Replicability of DREEAM renovations

1892: "We will transfer the approach to other projects if possible. We have all the data, so it's positive and replicable: we want to make almost the same approach and to plan the next renovations, we learned a lot, especially the use of solar energy, we applied for funding to install more solar energy. Also we will integrate the tenant engagement concept developed by Savills in DREEAM in the future. In future replications we will continue to make the measurement of the U value by our team, but we would not replicate the monitoring process in DREEAM or only if we can have an entire monitoring before renovations to have an accurate comparison before and after renovations".



Figure 2 - U-value: Use of the technology by our 1892 engineers in the run-up to a renovation

What type of analysis are you the most interested in to quantify the impact of DREEAM project on your ROI to determine the replicability potential?

1892: "In the future, we will analyse the PV performance, we will look at the storage system to determine the production over the years and how the storage systems performs".

1892 learned a lot about PV uses and about the following DREEAM completed tasks:

- Check with every renovation and every new building;
- Check sensible implementation for the whole residential portfolio;
- Reduction of operating costs for the residents due to the use of solar power for general electricity (elevator, lighting of hallways, etc.)



• Landlord-to-tenant electricity (supply): the energy generated by the PV system is then supplied to the tenants of this building, they get a better electricity price.



Figure 3 - Photovoltaic installation in Berlin Pilot site

1892: "Due to the fact that we started the Project in the year of the renovation, we have no data before to compare the consumption. We have just our historical consumptions. We would like to replicate DREEAM approach inside our company, we renovated a third of our property, we will try to bring this approach in other renovations, the platform we haven't seen it yet, we are very interested with this tool, architects too. We check the energy consumption between years. We just look at the data base collected with the monitoring equipment but as there were multiple technical problems the data collected in the Berlin pilot site are not sufficient for us to buy a monitoring solution after DREEAM project, but we are interested to see the potential of data monitoring for other renovations projects. For future projects, just the monitoring of data is not enough, and the connection between censors, servers and platforms was not good, so it's problematic, we need a solution that is easier, with more analysis and added-value from the analysis and without technical problems".

For reminder, in the DREEAM project, the monitoring performed consisted of the following:

- Sensors for humidity and temperature in some dwellings installed;
- monitoring of the electrical consumption of common areas and PV generation;
- monitoring the heating consumption (district heating);



3.6 Other replicable approach from DREEAM project

In addition to their tenant Information, 1892 see an added value in the tenants' individual interviews and the sociological approach developed in DREEAM project by Savills' sociologist. 1892 intends to replicate the following approach developed in the WP4:

- Interviews focus on the comfort of tenants before and after renovation;
- Continue interviews with residents before and after renovation (social considerations: expectations and problems);
- Training of Green neighbours as part of the engagement programme of the same name.



Figure 4 - Savills sociologist coordinating an interview and co-design session with a tenant

in Berlin pilot site and the social worker of 1892.

Transfer to the residential housing sector

• 1892 was the winner of the ERHIN Award 2019 (European Responsible Housing Awards) in the category "More than a roof – supporting communities of equal opportunities"







4 ATER - Treviso Pilot site - Italy



Figure 5 - Pilot site in Treviso with Tower A and B in red.

Synthetically, the project aimed to minimize power consumption and this was achieved in Treviso pilot site through:

- **Optimization of passive systems** (building envelope) to minimize the active ones;
- Elimination of the worst thermal bridges (around the windows and radiators) using innovative Aerogel panels/coats.
- **Reduction of the demand for heating/DHW natural gas** with new high efficiency condensing boilers.
- **Reduction of demand of heating/cooling electricity**: using CMV-Controlled mechanical ventilation system with heat exchangers.
- **Renewable sources**: solar panels for DHW (dwelling consumption) and photovoltaic panels for common parts electrical consumption (elevator, stairs & garden lightening).
- BMS-innovative ICT based building energy management system:
- **DHW energy management** by solar panels or gas grid
- Individual sub-metering of gas and electricity consumptions connected with the remote monitoring system



Lessons learned:

CMV controlled ventilation systems for energy recovery allows partial recover of heating or cooling energy that would be lost with simple air change (for example by opening windows).

The innovative actions had to be carried out alongside standard 'state of the art' action, not financed through the DREEAM project to reach a Near Zero Energy retrofitting level with:

- 1. Reduction of heat losses through the insulation of all the facades, roof and first/last floors (big EPS outer coat);
- 2. Lowering of ceilings of bathrooms and apartment corridors (from 2.80 to 2.40);
- 3. Application of high energy efficiency windows;
- 4. High efficiency condensing boilers to reduce the demand for natural gas;
- 5. Scaffolds and safety of building site costs;
- 6. The context of public tendering in Italy for Social Housing that requests strict criteria of rotation and transparency, makes it necessary to carefully supervise the works in the building site to guarantee at least a standard quality;
- 7. In the EPC contract it is essential to evaluate and to manage these aspects, as the quality of the renovation works and the respect of timeline are fundamental factors for the ROI;
- 8. It is also essential to have an in-depth knowledge of the characteristics of one's real estate portfolio and of the technological choices (concept) that allow a quick return on investment.





4.1 Main conclusions on the financial impact of DREEAM approach and renovations

- Since its origin, in the early 1900, the italian welfare system is based mainly on «building houses to sell» and not «to rent» (*like Spain, Greece and France and unlike Northern europe public Social Housing politics*). Despite that, Social Housing italian public companies now have a rather obsolete/old building portfolio to retrofit, mostly built between 1914 to 1980.
- Because of the economic crisis, probably for the first time since 1914, there is a big lack of public funding.
- Most social housing tenants are in high/medium protection welfare area (47% average renting fee is 34€/dwelling/month) and they often can't afford high heating/cooling expenses.

According to the current national law, Italian social housing public companies cannot raise social rents and they are not allowed to manage energy.

With the DREEAM Project ATER tried to find a new way to compensate this lack of funds: the EPC contract.

- ATER developed a new business model, the EPC: from the savings in the bill it can return the investments for renovation works and it can help tenants to pay less for energy consumption;
- Thanks to a legal support paid by DREEAM project (subcontractor costs):

- ATER prepared a new kind of public tender for selecting the ESCO company;

- ATER created an innovative ESCO/TENANT public contract model for energy supplies / management;

• ATER with DREEAM scientific partners (energy engineers and financial experts) compared 4 renovation concepts, learning how to do a cost/benefit analysis (payback period) in EPC/ESCO projects.







4.2 Analysis of energy performance post-renovations in DREEAM project

What additional information you would like to receive:

ATER: "More info on rebound effect".

4.3 Main conclusions about the ROI of the DREEAM renovations

The ROI limited as the cost savings go to the tenant but the ROI is still to be determined by ATER.

4.4 Replicability of the DREEAM renovations in other similar building portfolios

It is still to be determined for ATER.

4.5 Other approach learned in DREEAM project to replicate in the future projects

ATER: "ATER understands that tenants' behaviours is a strategic tool in EPC contract because they play a crucial role in the renovation programmes since their level of acceptance influences the deployment of technical choices".



Figure 6 - ATER's manager and a tenant during interviews in Treviso pilot site



Lessons learned according to ATER:

- The importance of an in-depth audit of the building and a greater knowledge of ATER portfolio;
- To understand why and how to involve tenants and to support energy saving behaviours (monitoring system and ICT control and innovative socio-technical instruments);
- To manage ATER public employee team in a European project;
- To realize that the Italian public SH sector is very different from the north-central Europe one (legislation, public tenders, welfare, aspects of the crisis on entrepreneurship ...)

4.6 Analysis post-renovations

Skills to develop in future projects according to ATER based on the experience in DREEAM:

- To understand better how to do an EPC contract model in italian public SH/ welfare scenario, because of the legislation changes;
- To comprehend the importance of quality control step, that allows to ATER TV to have the complete supervision and a strict control of ESCO technical choices and ROI;
- To gain experience in business planning, national funding and tax breaks and best payback period of retrofitting design actions;
- To focus on: ROI; protection of disadvantaged tenants in EPC contracts, maintenance aspects of innovative devices; real global costs and final result of (innovative) works;
- To manage «collateral effects» in public tenders, generated by the crisis on entrepreneurship.

Conclusion of ATER: DREEAM helped ATER to realize that social housing system in Italy could also survive without national/regional funding thanks to an external legal support to prepare a new legal procedure: the EPC/ESCO tender, and a tenants/ESCO contract model. Currently this not widely used in Italy, but ATER aimed to find a new way to overcome this period characterized by lack of funding for retrofitting

