



**A Summative  
Assessment of the  
Connexus Warmer  
Homes Project**

**A Final Report**  
to Connexus  
Homes Limited  
June 2023



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## EXECUTIVE SUMMARY

The Connexus Warmer Homes Project was part-funded by European Regional Development Fund (ERDF) and led by Connexus Homes Limited. This is a summary of the findings of an independent Summative Assessment undertaken of the project's implementation.

### PROJECT CONTEXT

The first aim of the Warmer Homes project was to improve the carbon and energy performance of the existing housing stock based on the outcomes of modelling to develop a whole house plan to meet Passivhaus Retrofit Standard (EnerPhit) standards. A second aim was to use the knowledge and lessons arising from the design and delivery of the project to inform a 30-year investment plan for Connexus, to bring its housing stock to near net zero performance by 2050.

This Summative Assessment assesses the success of the Connexus Warmer Homes Project in meeting its objectives and delivering its targets. It used a combination of desk research, research, qualitative interviews with stakeholders and a review of economic and wider impacts and performance. Baseline research from the Marches Energy Agency was used to develop an insight into the Project's outcomes.

Strategic plans at national level underpin the rationale and premise for the programme. The UK Government has committed to achieve net zero greenhouse gas emissions by 2050<sup>1</sup>. 17% of heating emissions from buildings came from homes, which is comparable to the contribution of all petrol and diesel cars, it is acknowledged that more must be done to decarbonise homes to help meet the UK's Net Zero aims<sup>2</sup>.

There is a strong case that the reduction of heat loss and the improvement of the energy efficiency of the fabric of buildings is the most cost-effective and robust method of improving the energy efficiency of a building<sup>3</sup>. Essentially, the components and materials which a building is made of, such as the walls, floors, roof and windows/doors will impact the level of energy saved throughout its lifespan.

Annual fuel poverty [statistics](#) in England (2023) show that in 2022, 13.4% of households (3.26 million households) in the UK were in fuel poverty. Rising energy prices caused a slight overall increase in fuel poverty in 2022. Social housing tenants are more likely to have low incomes, making them particularly vulnerable to fuel poverty. Connexus' financial business plan has a fully funded maintenance projection to 2055 worth just under £1bn. This ERDF project provides a timely opportunity for deep retrofit learning and evidence generation with the potential to influence the maintenance plan.

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<sup>1</sup> BEIS (2022) 'Building for 2050: Low cost, low carbon homes' [Available here](#)

<sup>2</sup> <https://publications.parliament.uk/pa/cm5802/cmselect/cmbeis/1038/report.html>

<sup>3</sup> Malone Architecture (2023) 'Building & maintaining a sustainable home – how to improve the fabric efficiency' [Available here](#)

## PERFORMANCE AND IMPACTS

At the project closure date the Warmer Homes Project is anticipated to spend £5.8m, over double the original budget of £2.6m. Several factors caused the spend to be over budget by a large margin including supply chain issues and rising costs of delivery. The ERDF budget increased by some 31% from £1.1m to £1.4m (though the intervention rate declined from 40% to 24% as Connexus allocated considerably more match than anticipated).

At the time of the evaluation the project spent just 39% of its budget with a considerable £843,000 remaining. The intention, given the increased costs, was to absorb the full amount by the end of the programme. By the end of May 2023:

- 50 households had an improved energy consumption classification, 59% of the target (85).
- 92 tonnes (CO<sub>2</sub>e) of carbon reductions were recorded, 61% of the target.

The economic and wider benefits are as follows:

- £3.48m in discounted present value lifetime social benefits.
- £0.78m gross and (£0.22m net) carbon reduction values
- 164 gross temporary construction jobs (117 direct and 47 indirect) and 85 net temporary construction jobs (61 direct and 24 indirect).
- Gross construction related Gross Value Added of £13.1m (£6.7m Net Present Value GVA)
- The contractor is providing local employment opportunities and apprenticeships and investing in community facilities.

Prior to the works being carried out, homes were poor at retaining heat, due to draughts within the home. The levels of insulation in the homes were insufficient. Satisfaction forms were sent out to tenants to gather their views since the changes have been made. Feedback from tenants on the impact of the works have been positive. Tenants find that their homes retain heat much more efficiently and so there is less need to turn on their heating systems as often as they used to prior to the Project.

Much learning has been realised through the Warmer Homes programme. One of the Project targets was to use learning from the project to inform future works. Stakeholders agree that there has been useful learning as a result of the project, including areas around what works and what does not. There is also learning surrounding appropriate budget and targets for future projects. Stakeholders agree that although improvements can be seen in the short term, there must be a re-evaluation of impacts over the long term to realise impacts in further detail.

## PROGRAMME DELIVERY

The aim of the Warmer Homes project was to improve the carbon and energy performance of the existing housing stock based on the outcomes of PHPP modelling to develop a whole house plan to meet EnerPhit standards. A second aim of the project was to use the knowledge and lessons arising from the design and delivery of the Warmer Homes project to inform a 30-year investment plan for Connexus, focusing to bring its housing stock to near net zero performance by 2050. The objective was to reduce

carbon in current buildings by focusing on working towards deep retrofit. There was the acknowledgement that Connexus' current housing stock had a long way to go to reach zero carbon, but this project would help take practical steps towards those targets. To date the level of retrofit needed for homes to achieve the Government's low carbon targets has not happened at the scale and pace required.

As well as aligning with government low carbon goals, there was also a focus to improve the condition and look of the properties to ensure tenants have a warm, safe place to live. A secondary outcome of the Project has been to resolve mould and damp issues. The project upskilled delivery partners in how to carry out deep retrofiting, improving knowledge for Connexus Homes, designers and contractors alike.

The Project's design incorporated a 'fabric first' approach to the pathway to net zero so that impactful achievements were made in an affordable manner. This approach involved the fitting of new energy efficient doors, triple glazed windows, and cavity wall insulation. This follows the innovative PHPP pathway with associated attention to air tightness and designing out cold bridging (thermal weak spots).

The Project was appropriately designed to achieve its objectives yet there was considerable 'on the job learning'. The retrofit design was led by a PHPP modeller. The Project was also supported by an architect to ensure the design was deliverable.

The project team was unable to facilitate competitive dialogue with contractors due to a lack of initial positive response to procurements opportunity. This delayed the process somewhat and the reasons are discussed in the report. There were a further number of technical and non-technical challenges that arose during the Project which led to delays in delivery which are also highlighted.

Chapter two of this report notes that the retrofit process was challenging for some with impacts on their privacy with noise disturbance and contractors in their homes. Generally, though tenants were 'happy' with the outcomes - reductions in condensation, mould, and draughtiness and a greatly improved appearance of their property. This element of the process was considered a success.

The Project has allowed a systematic and planned programme of works. Previous measures to address energy efficiency were made in an ad hoc manner with no future planning. As well as the positive feedback from tenants regarding the impacts of the changes that were made, the outcomes of these actions are supported with detail around areas such as air tightness from a PHPP consultant. Stakeholders agree that the project targets were challenging considering the timeframe but, broadly speaking realistic and achievable.

### PROGRAMME STRENGTHS AND WEAKNESSES

#### STRENGTHS

A strong collaborative culture was key to the completion of the works to the Enerphit pathway. Connexus has improved understanding of the retrofit process and delivery challenges. It was a ground-breaking project testing the implementation and benefits of a fabric first approach.

The Tenant Liaison Officers (TLO) brought tenants on board with the planned changes. They coordinated subcontractors with tenants and provided up-to-date communications.

The project has improved the energy efficiency of homes and met the key objective of saving carbon. The impact on tenants has been positive, improving their quality of life by increasing comfort, reducing cold and risk of damp, cold and draughts and potential risks to health due to underheating. A PHPP consultant carried out the modelling of the Project and was on-site working with contractor to ensure air tightness standards were met. It improved the contractors understanding of the new retrofit standards.

Marches Energy Agency (MEA) independent role and expertise resulted in a successful engagement and monitoring exercise. There is a careful balance to strike between informing and engaging tenants and raising expectations. Some neighbouring privately owned properties were affected by the works' disruption which required some work to get them on board.

The project has reaffirmed the fabric first approach following an Enerphit pathway and there is a better understanding of Connexus' potential offering to customers. A fabric first approach comprising external wall insulation and heating system specifications, tendering and installation processes will ensure Connexus and partners are able to meet EnerPHit standards in the future. Finally internal commitment from Connexus has been extraordinary and in terms of this pilot worked well.

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### BARRIERS AND WEAKNESSES

Pre-and post-procurement challenges were experienced. For instance, initially there were few interested bidders perhaps reflecting workload/capacity issues on the bidders' side during Covid and there were difficulties in getting and retaining sub-contractors on-site. There are clear gaps in the knowledge and understanding of Enerphit standards and requirements amongst architects, designers and installers.

Relationship with new contractors was not as strong as older contractors which has affected timescales and delayed progress. Working with utilities including BT, Cadent and Western Power Distribution has been time consuming and collectively caused some significant delays.

The unit costs for this project were much higher than expected and it was hard to complete them all within the ERDF timescales. Building material costs increased since the time the bid was made which made budgeting difficult. Changing plans for which stock archetypes were to be retrofitted and which were eligible for ERDF funding took some time to finalise.

With so many partners involved clarity around roles will avoid any confusion. Logistically it has been a complicated programme to phase. In Sandpits for instance voids, which were spread everywhere, needed to be addressed. The idea was to address voids, but ERDF timescales meant these couldn't be addressed within the timeframes to decant people and move them back in.

### LESSONS LEARNT

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#### FOR CONNEXUS HOMES LTD

The following lessons learned have emerged from the discussions with stakeholders and delivery partners. Achieving Enerphit standards is a highly beneficial but expensive process and can't easily

be automatically rolled out as local property conditions, archetypes and settings play an important role in determining the right approach. More pilot work is required to better understand what sort of EPC standard and investment are required for its properties to remain on the path to net zero. This will ensure it can take a fabric first approach in an affordable manner. There are lessons around phasing and supplier knowledge and engagement. Early engagement of internal teams and external partners including planners and utilities is a key lesson to avoid excessive delays. Future project steering groups should play an critical friend role and fully utilise the expertise of project boards.

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#### FOR THOSE DESIGNING AND IMPLEMENTING SIMILAR INTERVENTIONS

A baseline study of tenant circumstances and ongoing pre and post works monitoring (temperature, energy use etc) will ensure that benefits and outcomes can be measured. The preparation phase is important. Getting design work in advance is more efficient and cost effective than afterwards.

The requirements and specifications should be communicated with contractors at an early stage ideally via an expression of interest stage or soft market testing. Similarly, contractors need seamless and early engagement with design teams and to be involved in technical meetings, especially with the move to new standards. There is a need for specialists in the delivery and procurement team otherwise a very steep learning curve will be required. It can be expensive learning on the job. Cost contingency is advised for Enerphit projects in case of unknowns, procurement challenges and/or delays. Building a strong relationship with the contractors will help smooth the delivery process and ensure that any emerging issues and challenges can be collectively addressed. A contractor competitive dialogue approach should be considered.

Tenants need to be made aware of energy efficiency cost savings and the transformational capacity of a fabric first approach to help tackle damp, mould, poor air quality and the effects of fuel poverty in social housing. A combination of tenant engagement approaches is advised as well as a strong presence on site to build good rapport.

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#### FOR POLICY MAKERS

Revenue funding is needed to manage retrofit projects effectively. This will allow the preparation of the procurement team in understanding the Enerphit standards, requirements and delivery priorities. Retrofit is a long and complex process that requires political support, multiple funding streams and long-term investment and commitment. There is a need for (a) better understanding of Enerphit standards amongst contractors and some social housing providers as well as awareness of the potential non-technical barriers such as tenant engagement, planning, tenure mixes and phasing, and working with utilities. (b) more funding and systematic promotion of Enerphit standards and their benefits. The policy and regulatory framework for achieving Enerphit standards needs to be more sophisticated and stimulatory.

There should be more widespread dissemination and development of new technologies to support Enerphit development including guidance on when and how to introduce new technologies on a 'fabric first' approach. Finally much more investment is required in construction skills and education around, for instance, the requirements and design standards to achieve Enerphit objectives.

# 1 INTRODUCTION AND PROJECT CONTEXT

This chapter introduces the aims, objectives, and activities of the Connexus Warmer Homes project. It discusses the project's rationale and the sub-regional and national strategic context. The scope of the evaluation study, the objectives and approach are also covered.

## 1.1 PROJECT SUMMARY

Connexus Homes Limited was established as a result of the joining of Shropshire Housing Group and the Herefordshire Housing Group, each with a reputation for delivering high quality homes and support services. Connexus Homes Limited now has a combined portfolio of around 10,000 homes across Shropshire and Herefordshire including 22 sheltered housing schemes, a supported housing scheme for young people (Ludlow Foyer) and a refuge for women escaping domestic violence. The Group also provides a range of home support services through its Independent Trust, Home Life service and mobile support services for vulnerable adults.

The aim of the Warmer Homes project is to improve the carbon and energy performance of the existing housing stock based on the outcomes of PHPP modelling to develop a whole house plan to meet EnerPHit standards. A second aim of the project is to use the knowledge and lessons arising from the design and delivery of the Warmer Homes project to inform a 30-year investment plan for Connexus, focusing on bringing its housing stock to near net zero performance by 2050.

The objectives of the project are to:

- Through PHPP modelling, provide a clear pathway for future investment to achieve energy efficiency retrofit to Passivhaus/EnerPHit standards in many more homes.
- Ensure that the PHPP model design details are architect reviewed to reduce the risk of unintended consequences including buildability or future maintenance.
- Engage customers with a visually clear deep refurbishment approach.
- Measure the outcomes of the project to provide a compelling evidence base to help inform future investment over the next 2-3 decades.
- Provide an example that could help inform wider retrofit opportunities.
- Through the use of PHPP, to provide detailed and accurate guidance, advice and support on how to achieve Passivhaus/EnerPHit standards for the homes in the project while provide a 'whole-building' solution outlining the steps needed to achieve carbon reductions of up to 905 on current usage.
- To support low carbon innovation by then using PHPP to develop an external wall insulation and heating system specification, tendering and installation process that would be compatible with meeting Passivhaus Retrofit Standard (EnerPHit) in the future.
- To undertake further research and install near-to-market smart heating controls.
- To undertake a detailed customer engagement and monitoring programme to assess project impacts and success, and to use that to potentially further increase the use, investment and

uptake of low carbon technologies, energy efficiency measures and smart energy systems in the housing stock.

The Warmer Homes project undertook a number of Project Change Requests (PCR) as a result of the impact of Covid-19 on the project, and procurement challenges which in turn impacted the delivery. The archetypes of stock which were to be retrofitted were adjusted in PCRs. Initially, the project intended to retrofit 80 off-gas 1950s brick-built properties with filled cavity walls in Shropshire and 52 1960s built mains gas heated properties with non-traditional solid wall construction in Herefordshire.

After the approval of PCRs, the location and archetype of stock to be retrofitted changed to three-storey flats in Hereford, and the testing of the design on two Shropshire pilots – 77 properties/voids in Sandpits Avenue and a block of six rural properties off mains gas. The six rural properties were also removed due to the final ERDF deadline.

### 1.2 RATIONALE AND MARKET FAILURES

The Government commits to achieve net zero greenhouse gas emissions by 2050 across the UK<sup>4</sup>. With both new and existing homes accounting for 17% of greenhouse gas emissions in the UK, it is acknowledged that more must be done to decarbonise homes to help meet the UK's Net Zero aims.

There is a strong case that the reduction of heat loss and the improvement of the energy efficiency of the fabric of buildings is the most cost-effective, and robust method of improving the energy efficiency of a building<sup>5</sup>. Essentially, the components and materials which a building is made of, such as the walls, floors, roof and windows/doors will impact the level of energy saved throughout the lifespan of the house. Heating is the biggest consumer of energy in homes so reducing the amount of energy used for heating is key to reducing energy consumptions and carbon emissions. Homes can be made more energy efficient by installing efficient heating systems however, reducing heat losses and improving the efficiency of the building fabric is considered more impactful and cost effective.

A household is considered fuel poor if they live in a property with an energy efficiency rating of band D or below, and/or when they spend the required amount to heat their home, they are left with a residual income below the official poverty line. An article by [The National Energy Action](#) outlines that rising energy costs, low incomes and energy inefficient homes are reasons why an increasing number of households are fuel poor. Fuel poverty can have negative effects on all aspects of one's life. Cold homes can cause or worsen serious health conditions such as heart attacks, stroke, bronchitis and asthma. Fuel poverty can also impact one's mental health. The impact on the UK economy is also significant with £1.3bn spent each year on health services in England on treating illnesses caused by cold homes.

Annual fuel poverty [statistics](#) in England (2023) show that in 2022, 13.4% of households (3.26 million households) in the UK were in fuel poverty. This is a .3 percentage point increase from 2021 (95 thousand households). Rising energy prices caused a slight overall increase in fuel poverty in 2022.

Social housing tenants are more likely to have low incomes, making them particularly vulnerable to fuel poverty. However, social housing, also presents an opportunity to support people out of fuel poverty by

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<sup>4</sup> BEIS (2022) 'Building for 2050: Low cost, low carbon homes' [Available here](#)

<sup>5</sup> Malone Architecture (2023) 'Building & maintaining a sustainable home – how to improve the fabric efficiency' [Available here](#)

increasing the energy efficiency of houses relatively quickly<sup>6</sup>. Upgrading blocks or streets of similar homes, by one organisation, is often faster and more efficient compared to the improvement of other types of housing.

Looking towards a model for the UK's social housing retrofit, [The Green Finance Institute](#) highlights barriers to retrofit, for example, short term funding and supply chain constraints. Longer term funding is needed to give housing associations and contractors the confidence to begin larger retrofit programmes and would allow for longer term planning and contracts. A lack of skills and knowledge, and the high costs of new technologies means that retrofitting on a large scale and to an acceptable cost and standard, can be a challenge. At a time of rising material and labour costs, there is a lack of capacity within the supply chain to be able to respond to large scale energy efficiency capital works. Investment in the upgrading of social housing stock can also be highly impactful in creating a pipeline of guaranteed work, encouraging apprentices, builders and suppliers to enter the retrofit sector.

### 1.3 EVALUATION SCOPE AND STUDY OBJECTIVES

This summative assessment aims to assess the success of the Connexus Warmer Homes project and the extent to which objectives are met. Final observations and recommendations are sought in this evaluation to inform the future of the project.

The scope of this report covers:

- An overview of the Connexus Warmer Homes project and the support it provides,
- The project's achievements in terms of outcomes and outputs
- Feedback from tenant liaison officers about the views of the tenants
- Feedback from stakeholders and partners in delivering the programme,
- Lessons learnt.

An inception meeting was held to confirm the study approach, agree the principal milestones, and discuss the development of the programme – providing insights to its context and original rationale. A desk review of market failures and the strategic context was undertaken (Chapter 1). Performance against Project targets are considered and economic impacts feature in Chapter 3.0. 10 stakeholder and delivery partner interviews were conducted and reported in Chapter 4.0. Three tenant liaison officers were consulted to gain an insight into the tenant perspective of the project outcomes. Their views are also discussed in Chapter 4.0. Lessons learned, recommendations and conclusion are provided in Chapter 5.0.

### 1.4 STRATEGIC CONTEXT

#### LOCAL CONTEXT

Connexus' financial business plan has a fully funded maintenance projection to 2055 worth just under £1bn. This ERDF project provides a timely opportunity for deep retrofit learning and evidence generation with the potential to influence the maintenance plan. Connexus Homes recognise that much of their stock has reached or is approaching its mid-life point. Much investment is required to up-keep these homes, and alongside this, the potential for the integration of energy efficiency retrofit.

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<sup>6</sup> UNFCCC (2022) 'Retrofitting social housing could spark UK green homes revolution' [Available here](#)

## UK GOVERNMENT

The [UK Climate Change Act](#) highlights the UK's aim of reducing greenhouse gas emissions by 100% of 1990 levels by 2050. The Climate Change Act requires the government to set legally binding 'carbon budgets' which are set twelve years in advance to allow policy makers, businesses and individuals to time to prepare and make changes.

The specific commitments around the decarbonisation of social housing within the [BEIS Net Zero Strategy](#) includes the upgrading of fuel poor homes EPC band C by 2030 where cost-effective, practical and affordable. The Strategy also considers setting a long-term regulatory standard for social housing. In 2019, 60% of homes in England, 17% of which are socially rented homes have a lower energy performance than EPC band D. Improving the energy efficiency of homes by taking a fabric first approach is the key to ensuring the transition to low carbon heating is cost effective. By 2050, nearly all buildings will need to be almost completely decarbonised by making use of technologies.

The Strategy outlines the wider benefits to the decarbonisation of buildings. As well as investment and exporting opportunities for goods and services, and the growth of key markets, decarbonising buildings will invest in the equality of living standards and job creation. There will be a reduction in the cost of energy bills, support in tackling fuel poverty, improvement in the health of residents and increases in property value.

## 2 TENANT PERSPECTIVE

This chapter contains details of the baseline research undertaken prior to and during the retrofit works to give an insight into the impacts of the Project on tenants and their homes.

### 2.1 ABOUT THE RESEARCH

The Marches Energy Agency carried out baseline research to gain a deeper understanding of the impacts that the Warmer Homes Project had on the tenants and their homes. The lived experiences of the tenants formed a key part of the research, for example, thermal comfort, the prevalence of condensation, damp, and mould in houses, along with the costs of keeping warm.

Qualitative data was collected in the form of three in-person interviews with occupants. Quantitative data was gathered to understand the temperatures and relative humidity of the homes at various times over the course of a year by the installation of dataloggers. Data was gathered from a range of buildings, including off-gas grid homes in rural Shropshire, narrow cavity brick semi-detached homes and concrete 'Cornish' 3 storey blocks of flats in Hereford.

Initial interviews with 32 householders/occupants were undertaken in October and November 2019.

### 2.2 HOUSEHOLD CONDITIONS (PRIOR)

Chronic health conditions were common in the homes that were surveyed. Chronic health conditions were present in 38% of surveyed homes in Hereford, 56% in Hunderton's top floor homes and 63% in rural Shropshire properties. Figures are likely to be higher due to the way in which surveys were carried out in that it relied on self-disclosure.

Respiratory conditions were the most prevalent conditions present followed by arthritis, joint and general mobility problems. Thyroid and heart conditions and high blood pressure were also prevalent across households, and conditions which require additional heating (poor thermal comfort can result in discomfort, fatigue, headaches and musculoskeletal problems).

Over 60% of households mentioned excessive draughtiness. 89% of households in Hunderton cited draught issues. Draughty wall vents in living rooms, bedrooms and kitchen cupboards were noted in some homes. Persistent damp, condensation, and mould in buildings was a key issue in all households that were surveyed. These issues were mainly present in bathrooms and bedrooms. Dampness, condensation, and mould was found to be common on interior walls. They were less common in living rooms but still quite prevalent. Only 6% of interviewees had air source heat pumps. The energy costs for the previous year were approximately 34-69% higher than industry figures for an average 3-bedroom household.

Due to the complexity of the definition of fuel poverty, energy stress levels were a focus of data collection when undertaking baseline research. Average daily temperature levels should be 18 degrees or above with relative humidity below 70% which is the threshold measuring the increased risk of mould. Research found that the average temperature of homes varies hugely during the heating seasons, but this tended to stabilise in the summer. There was a large range of warmth levels during winter.

Based on the findings 65% of households are likely to be experiencing energy stress and 27% are highly likely to be experiencing energy stress. Those who are not experiencing energy stress may be taking on financial stress to achieve appropriate levels of comfort.

### 2.3 RETROFIT PROCESS FEEDBACK

Household occupants reported on their experience on having works done on their homes, for example, external wall insulation, replacement windows and extractor fans. Interviews were conducted with occupants at Hunderton Road and The Oval. Occupants felt that the works were 'bothersome' but not too 'problematic'. On reflection, those surveyed would have liked to have the opportunity to decant whilst works were being carried out.

Any issues experienced during the delivery of the Project that were highlighted during the research were forwarded to Connexus Homes. Common concerns included a lack of privacy, noise and dust/untidiness. Top floor occupants were disturbed by the noise of re-roofing works. The installation of triple glazed windows also brought some issues to tenants. For example, they felt they had lost the ability to ventilate, and their security was compromised. Some tenants report minor internal wear and tear as a result of the works and difficulty cleaning the new windows. Most respondents said the extractor fans were quiet. A small number of people felt the fans did not work efficiently or found that they were not working at all.

Overall occupants were content with the works carried out and they were pleased with the reduction of draughtiness, condensation, and mould experienced. Occupants claimed the external appearance of the buildings was much improved.

Post retrofit assessments show that the Heat Transfer Coefficients that were measured during the design stage were overachieved by 37%. Some flats overperformed by over 50%. In terms of heat loss parameters, buildings overperformed by 39% more expectation at the design stage. Of the households that were analysed, seven met or exceeded PassivHaus standards of heat loss. The remaining three exceeded the Future Homes Standard. Two flats at The Oval underperformed on their design Heat Transfer Coefficients and Heat Loss Parameters by 27% and 52% respectively. This will be investigated.

Increased thermal comfort was achieved for most of the tenants interviewed. They are not turning on their heating on as much as they used to. With regard to the risk of mould, there was little difference between relative humidity levels before and after the works took place. Improving the air tightness of buildings can lead to higher levels of relative humidity (RH). The high levels of draughtiness before the works could have mitigated RH levels to some extent. Data retrieved from some households show there is still a risk of the development of mould. These were of homes where the 70% threshold was often breached.

### 3 PERFORMANCE AND ECONOMIC IMPACT

This chapter reports on the spending and outputs at the time of the evaluation. The section also estimates the economic and wider impacts of the investment for the Connexus Warmer Homes Project.

#### 3.1 ERDF EXPENDITURE PERFORMANCE

At the project closure date the Project is anticipated to spend £5.8m, over double the original budget (£2.6m). Several factors caused this including supply chain issues and rising costs of delivery. The ERDF budget increased by some 31% from £1.1m to £1.4m (though the intervention rate declined from 40% to 24% as Connexus allocated considerably more match than anticipated).

Original Project Total (£)	£2,639,229	Original ERDF value (£)	£1,055,691	Intervention Rate	40%
Current Project Total (£)	£5,756,799	Current ERDF Total (£)	£1,379,616	Intervention Rate	24%

At the time of the evaluation the project spent 39% of its budget with a considerable £843,000 remaining. The intention, given the increased costs, is to absorb the full amount by the end of the programme.

Indicators / Expenditure	Original Funding Agreement	Most recent Funding Agreement Variation	Total achieved at time of evaluation	% of target	Projected at Project Closure	% of target
<b>Expenditure</b>						
ERDF Capital Exp, (£m)	£988,976	£1,295,118	£482,192	37%	£1,295,118	100%
ERDF Revenue Exp, (£m)	£66,715	£84,428	£53,972	64%	£84,428	100%
	£1,055,691	£1,379,546	£536,164	39%	£1,379,548	

Source: Connexus Homes Ltd. Monitoring Data, Programme Management Team

#### 3.2 OUTPUT PERFORMANCE

##### Funding Agreement Outputs and Delivery

Indicator	Orig. Funding Agreement Targets	Revised Funding Targets	Latest Output Total at Time of Evaluation	% of Target	Expected Delivery at Project End	% of Target
(C31) No. of HH with improved energy consum. classification	132	85	50	59%	85	100%
(C34) Estimated GHG reductions	338	152	92	61%	152	100%

Source: Connexus Homes Ltd. Monitoring Data, Programme Management Team

The table shows outputs achieved by the end of May 2023 and projections to the end of the project. At the time of evaluation, the headlines are as follows:

- 50 households have an improved energy consumption classification, 59% of the target (85).
- 92 tonnes (CO<sub>2</sub>e) of carbon reductions have been recorded, 61% of the 132-tonne target.

It is anticipated that both targets will be fully achieved by the end of the Project.

### 3.3 ECONOMIC IMPACT AND WIDER BENEFITS

This section assesses the economic and wider impacts of the programme.

#### APPROACH TO RETROFIT ECONOMIC IMPACTS

An assessment of the economic impact the retrofit process was undertaken comprising:

- Direct Employment: (Temporary construction employment impacts and resultant GVA).
- Indirect Employment Effects: The effect on suppliers and resultant productivity / GVA from construction/retrofit activity. The construction industry is a driver of growth in other sectors due to its heavy reliance on an extended and varied supply chain. It uses a wide range of inputs from many industries to produce its goods and services. Investment in retrofit therefore indirectly supports a broad set of industries as the increase in final demand filters through to key sectors which supply the social housing sector creating indirect jobs. An average Type II UK construction employment multiplier was used (1.40) to calculate the indirect construction employment effects.
- The HCA's Additionality Guide (Fourth Edition) offers guidelines in assessing the true impact of investments. In line with these, steps were taken to assess gross and net GVA, employment construction impacts and net present value:
  - Displacement was 25% at local level and leakage was assumed at a medium 25%.
  - The persistence of the benefits i.e., how many years the benefits are expected to persist and the period over which benefits will accrue until they reach their full potential. In this instance, a modest two-year time frame was chosen based on the approximate build period.
  - A decay of 10% per annum has been used i.e., the proportion of annual benefits expected to be lost from one year to the next due to economic changes, other investment decisions etc.
  - Calculation of the Net Present Value (NPV)<sup>7</sup> of the GVA benefit stream over a two-year persistence was discounting back and utilised an appropriate rate. The Green Book guidance has been followed which recommends discounting by 3.5% in order to determine NPV.
  - Kada estimates for GVA per FTE has used BRES (The Business Register and Employment Survey) and ONS (Office of National Statistics).

#### HEADLINE CONSTRUCTION ECONOMIC IMPACTS

Based on the end of the programme data available, the following table shows that the Warmer Homes Project created 164 gross Full Time Equivalent (FTE) temporary construction jobs (117 direct and 47 indirect) generating a total gross construction related GVA of £13.1m and Gross Value Added NPV of £6.6m. The contractor is also providing local employment opportunities and apprenticeships and investing in community facilities.

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<sup>7</sup> Net present value is a calculation that compares the amount invested today to the present value of the future cash receipts from the investment. In other words, the amount invested is compared to the future cash amounts after they are discounted by a specified rate of return.

Economic Impacts

	Gross Jobs	Net Jobs	GVA	NPV over 2 years
Operations (FTE)	164	85	£13,051,256	£6,675,912
Direct Jobs	117	61	£10,116,925	£5,174,958
Indirect	47	24	£2,934,330	£1,500,954

Source: Kada Research

WIDER BENEFITS

The Connexus Warmer Homes Programme has achieved wider environmental and social benefits. Using the [Green Book supplementary guidance](#) (valuation of energy use and greenhouse gas emissions for appraisal) it is possible to value greenhouse gas emissions. The impacts of carbon reduction over 25 years are as follows:

- £0.78m Gross Carbon Reduction Value (Carbon values per tonne of CO2)
- £0.22m Net Carbon Reduction Value (Carbon values per tonne of CO2)

The Project's investment in retrofit results in a number of social benefits. It has not been possible to conduct a full social return on investment for this small-scale review and the SA guidance suggests a proportionate approach to impacts. That said it is possible to put an illustrative monetary value of the direct gain of well-being enjoyed by those whose health is improved, measured by the value of the gain in Disability Adjusted Life Years (DALYs) plus i) the saving in NHS and social care expenditures, and ii) the gain in economic output (GDP) where those enjoying better health are of working age. Put simply, investment in heating and insulation measures can reduced cold, damp and mould and fuel poverty.

Using Cost Benefit ratios from other studies<sup>8</sup>, it is possible to present the potential scale of social benefits using the benefit cost ratio (0.64) in the Lambeth study (and treating the estimate with appropriate caution). The Warmer Homes project has the potential to generate some **£3.48m in discounted present value lifetime social benefits**.

VALUE FOR MONEY

Despite the challenges, Connexus remained committed to delivering the Warmer Homes project. Connexus has amended property lists to align Warmer Homes with other Connexus priorities, allocated additional match funding for both revenue activities and capital works, reprofiled internal budgets and rerun a number of procurements to identify changes in the market in terms of contractor interest and updated works costs and so obtain more tender submissions and better value for money than earlier procurements elicited. Rollout of the Warmer Homes design is being supported using a Social Housing Decarbonisation Funds (SHDF) grant.

3.4 STRATEGIC ADDED VALUE

Connexus has provided strategic leadership in the EnerPhit housing delivery and acted as a catalyst for low carbon innovation. It has been able to use its strategic influence and leverage to procure retrofit solutions. It has also managed to marshal and effectively engage a diverse range of partners from statutory agencies to contractors and tenants.

<sup>8</sup> The Lambeth Housing Standard Health Impact Assessment and Cost Benefit Analysis, CRESR, 2018, p44

## 4 DELIVERY AND MANAGEMENT

This section of the report explores the implementation of the programme. It was informed by interviews with stakeholders, partners and mentors (see Annex One for a list of consultees). It reflects on project delivery, impact, strengths and challenges.

### 4.1 RATIONALE AND STRATEGIC CONTEXT

The Warmer Homes project starts to address the lack of energy efficiency in Connexus properties. The UK has set a goal for GHG emissions to reach net zero by 2050 across the UK. In light of climate change and legislative drivers the Warmer Homes project allowed Connexus to deliver and energy efficiency measures, monitor progress, help reduce fuel poverty and improve thermal comfort and energy costs for occupiers.

The ERDF project provided a timely opportunity to gather some useful evidence and learning on the journey to net zero and inform and influence Connexus' £1bn maintenance programme to 2055.

The aim of the Warmer Homes project was to improve the carbon and energy performance of the existing housing stock based on the outcomes of PHPP modelling to develop a whole house plan to meet EnerPhit standards. A second aim of the project was to use the knowledge and lessons arising from the design and delivery of the Warmer Homes project to inform a 30-year investment plan for Connexus, focusing on bringing its housing stock to near net zero performance by 2050.

The Project aims to reduce carbon in current buildings by focusing on a pathway to deep retrofit or net zero. Stakeholders acknowledged that Connexus' current housing stock had 'a long way to go' to reach zero carbon, but this project provided an opportunity to make progress towards this ambition. Stakeholders felt that the level, pace and scale of retrofit required for homes to achieve the Government's low carbon targets was simply not happening.

The project helped to fill the knowledge gap for both Connexus Homes, designers and contractors alike who have all learnt about passive house planning and a 'fabric first' approach.

*"Deep retrofitting such as the works carried out by Warmer Homes is new for contractors. They probably would not have dealt with air tightness or thermal bridging of buildings before. Hopefully the project has helped to close that knowledge gap."*

As well as aligning with the Government's low carbon goals, there was also a focus on improving the condition and look of the properties to ensure tenants had a warm, safe place to live. A secondary outcome of the Project has been to resolve mould and damp issues. MEA gathered feedback from tenants to hear first-hand about their experience of having work carried out to improve their homes and the impacts realised as a result. Tenants and other local residents were positive about the external look of the retrofitted buildings. The project's works have improved tenant satisfaction and wellbeing.

## 4.2 PROGRAMME DESIGN

Stakeholders acknowledged that planning the Project prior to the Government publishing a clear policy and framework for retrofit was difficult. However, the retrofit design was led by a PHPP modeller which was useful in ensuring that technical aspects of the Project aims were met.

*"In some ways we ran before we could walk. The planning and development of the Project was ahead of its time as most of the policies, vision and framework from the Government have only recently been put in place. With that framework we're now working out what we want to do and what it might look like."*

As noted, the Project's design incorporated a fabric first approach on the pathway to net zero so that impactful achievements could be made in an affordable manner. It focusses on airtightness in addition to elemental energy efficiency values, along with attention to eliminating risks of cold bridging. This involves the fitting of new energy efficient doors, triple glazed windows, ventilation and cavity wall insulation to follow the innovation of the PHPP pathway. Based on impacts from the fabric first actions appropriate technologies can be deployed at the future date. Subsequent investment may involve external wall insulation and air source heating systems.

The Warmer Homes Project was appropriately designed to achieve its objectives, but it was a steep learning curve and the context of Brexit and Covid plus post government economic stimulus investment in retrofit made it difficult for it to be completed on time and within budget.

## 4.3 PROGRAMME DELIVERY

Procuring a contractor for the Warmer Homes Project was challenging resulting in delays. When drawing up the original design package, there was an ambition to use a competitive dialogue approach with contractors so any knowledge gaps could be incorporated into the tender specification.

*"We knew there were things we didn't know, and we tried to address that through competitive dialogue. We didn't know exactly what we needed to incorporate into the tender for the modelling and designer."*

There was little to no response to the first tender issued. Responses from the market as to why contractors were not bidding included a lack of capacity to deliver large and complex projects. Amongst other challenges and a few false starts this led to fewer properties being retrofitted than planned.

*"Having to carry out procurement processes and re-tender for various projects is not efficient when we could have engaged with contractors we had worked with previously. It's really important that we learn and really try to move that way [i.e. build strong contractor relationship]."*

The rising delivery costs were not anticipated with quotes double what was expected. This required additional funding from Connexus to continue and complete the Project. Seeking early architectural support did not prove to be as useful as anticipated as there were many on-site changes mid-works.

*"It was an expensive learning process, but we had to ensure it was deliverable."*

During the early stages of the Hunderton Road project, there were some supply chain issues which delayed the work programme and had knock on sequencing effects. For example, an issue with window supply led to a delay in carrying out EWI works. Some delays were beyond the control of the project delivery team, for example, early during the first project in Hereford some manufacturing issues were

experienced with the triple glazed windows. This was resolved and next scheme ran much more smoothly. This is touched on again later.

*"The programme's delivery at The Oval ran so smoothly because we knew, from experience, what we were doing and what order the works were going to be delivered. We also understood what to expect from the works in terms of disruption to tenants and noise levels. So, Connexus and SBS, the contractor, were much better prepared for the second half of the project."*

Having seen the nearby improvements made to houses in the first half of the Hereford project at Hunderton Road, tenants and local residents were more cooperative with TLOs when works at the Oval were carried out.

The planning and design stages for the Shropshire Sandpits scheme were difficult due to the different property styles on one block. There was a mix of semi-detached and terraced dwellings. Furthermore, there were several private owners who were part of the Sandpits block. To some extent they benefited from the works by an upgrade of their electrical system, but at a mixed tenure location it took some time for all embrace the developments around them.

A project phasing strategy for the design and delivery of Sandpits was complex due to the mix of voids. A focus on voids was initially a priority to meet ERDF outputs however, this became difficult to address as voids were widely spread geographically. ERDF outputs were also partly driven by sub archetypes. There were seven sub archetypes at Sandpits so in order for the outputs to be reached, sub archetypes had to be considered.

*"It was very complicated to try and get a deliverable programme that actually made logistical sense that could cope with voids, archetypes of blocks and private owners."*

The upgrading of voids required a full refurbishment. The works on voids were not undertaken due to the need to decant tenants from other buildings into them in order to carry out external wall insulation works on tenant homes. Although there were plans to deliver on 35 voids by the end of March 2023, programme slippages meant that that became impossible within a compressed timeframe.

It was felt by TLOs that Herefordshire properties were better maintained in comparison to Shropshire properties. This meant that extra maintenance requirements arose in addition to the planned works which prolonged the process.

*"We'd go out thinking we were just going to be doing quantum (heat storage) and then we'd find that it would need a rewire or it would need new windows, or the actual specification of the house needed to be updated to put these heating systems in. And that's where we found a lot of issues." - TLO*

As an innovation project, stakeholders agree that Warmer Homes has been successful in relation to the learning and knowledge gained around the design and delivery of a fabric first approach.

*"We have been able to roll out the design developed in Hereford to future projects, you know, as was designed, so that's worked very well. And we anticipate the same from Sandpits."*

Tenant liaison officers (TLO) found that managing the delivery of the Programme works required much planning when dealing with new contractors and sub-contractors. Sometimes subcontractors would not

turn up to their planned appointments for works to be carried out in homes or would leave works uncompleted. This impacted tenants as they may have had to take some time off work or rearrange their schedule for works to be carried out. TLOs agreed that developing a good working relationship with subcontractors is important for a smooth delivery process.

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## ENGAGING WITH TENANTS

Open days were set up to inform tenants of the Programme and give them the opportunity to share their thoughts and have their say on the planning of the Programme works. Despite an incentive of shopping vouchers attendance was minimal. Other methods of communication were deployed including newsletters and notice boards.

Initially some tenants were reluctant to cooperate with liaison officers. Several missed appointments or ignored attempts to contact them. However, as the Programme progressed, and improvements were more visible, TLOs found that tenants began to engage with them.

*"Once the first tenants who had works done, started to realise the impact of the changes, others were much more positive and engaging."*

TLOs found that by establishing a rapport with the tenants, over time, they become more cooperative and responsive and eventually positive about the Programme. Building trust and helping them to understand the benefits of fabric improvements was a key success factor for the Programme (and a lesson for others). TLOs try to accommodate tenant wishes and gave as much notice as possible before any works were carried out.

Tenants should be informed of any staff changeovers as this could affect tenants' support for the Programme, making it difficult for new staff to then rebuild relations. A strong presence on site helps to address concerns and minimise any misconceptions.

TLOs had access to a communications' material (digital and printed) including 21-day and 7-day work notifications. Notice boards were updated each week to inform tenants of which works were going to start and were. Tenants were made fully aware via both the contractor and Connexus of the works that were happening at given times.

## 4.4 PROGRESS AGAINST PROGRAMME AIMS

The project was aimed at addressing energy efficiency issues in Connexus' housing stock in a planned manner. Previously changes were made in a more ad hoc fashion. As well as documenting the positive feedback from tenants on the fabric first approach, there is a desire for the impacts and outcomes of the works to be substantiated for instance confirmation of air tightness from a PHPP consultant.

*"We probably need to give it another year so we can experience different seasons and confirm the works have reduced damp, condensation and mould."*

The prolonged design process did affect delivery and changes were often made to adapt to challenges encountered by each property and architype. For example, the windows for the first block were replaced several times because they did not meet the required specifications of air tightness and water tightness. Reaching a solution took a number of attempts which caused slight delays. These challenges were overcome through strong collaborative working and communication.

*"You can only actually realise whether a design works or not when you're on-site. Then you also have to consider whether the design is up to the suitable specification, working with the technical experts."*

*"The collaborative working with the technical support and conversations on site with the construction team and the principal designer, all had a common goal to meet the project's objectives."*

Stakeholders agree that the project targets were challenging considering the timeframes, but ultimately achievable. There were some unexpected circumstances which arose such as the exceptional rise in retrofit delivery costs (which doubled) between the initial planning of the project and going out to tender. This inevitably changed the project's shape, but where work have been completed there have been substantial benefits and improvements. As well as the reduction in energy usage, the air quality within the buildings has also improved with installation of new ventilation systems. The works have also helped to protect the buildings from any further decay by addressing issues of mould using CWI.

*"Recently, there have been media reports around the way housing associations deal with issues regarding mould and decay. So to address these issues have been really important."*

#### 4.5 PROGRAMME IMPACT

The Warmer Homes Project has reached and impacted on the intended occupants in a positive way. Tenant feedback has indicated that the programme has already had an impact on energy consumption.

Prior to the works being carried out, homes were draughty and had poor heat retention. The levels of insulation were simply insufficient. Feedback from tenants on the impact of the works have been positive. Tenants find their homes retain heat much more efficiently and so there is less need to turn on their heating systems, which is leading to savings on their energy bills. With the current cost-of-living crisis, and the unprecedented rise in energy bills, the impact on tenants is quite significant. Tenants also found that the triple glazed windows and new security doors have resulted in a reduction in noise pollution.

*"Having a cold or damp house can have wider mental health impacts on tenants. By making homes more energy efficient, tenants have a more comfortable house. They aren't worried about being cold, or bills and energy costs. So, it's quite positive."*

*"Tenants mentioned how the homes have improved; aesthetically for example they look a lot better. Against the backdrop of the streets, they [the refurbished properties] stand out and look very modern."*

Much learning has been realised through the Warmer Homes Programme. As noted earlier one of the Project's targets was to use the project learning to inform future works. Stakeholders agree that there has been useful learning around what works and what does not. There are important lessons around budgeting, phasing and setting targets for future projects.

*"It's been a fantastic learning curve for everybody involved. I've learned a lot about challenges that contractors come up against, which hopefully, I can pass on to my next project."*

Programme contractors have had first hand early experience to understand and delivery against, and comply with, the Government's new retrofit standards which require thermal bridging and continuous air barriers and insulation.

*"I think that this project has helped the contractors understand the new retrofit standards before they might otherwise have done."*

The Programme has reaffirmed the fabric first approach which was one of the legitimate pathways to consider for future retrofit frameworks and set a precedent for future retrofit work on other Connexus stock. Connexus is now better able communicate its offer to customers and tenants.

High build quality and health and safety standards were maintained at all times. The contractors were able to understand and carry out works on a scheme with unique and non-typical specifications to reach new Government standards in a short period of time. From a contractor's perspective, securing further work as a result of the project's delivery shows how successful it has been.

*"If you've got a principal contractor on board who can deliver, maintain the KPIs you have set at the start of the scheme then it's a win-win situation for both us and the clients."*

*"The feedback we have been receiving and comments that have been made on social media from the tenants and other locals about how effective the changes have been, is just a big tick box for us all."*

Stakeholders agree that although improvements can be seen in the short term, the impacts need to be assessed over the long term. The parallel MEA report reflects on the changes since the baseline. Data was collected around thermal comfort and temperature and relative humidity readings were undertaken. Meter readings and face-to-face interviews were also conducted.

#### 4.6 MANAGEMENT AND GOVERNANCE

The project was well managed but, with such an innovative project, the team experienced some challenges. A seamless link between project feasibility, design and delivery was hard to achieve as there were many unknowns and much learning was done 'on the job'. The economic climate adversely impacted on timing, procurement and construction costs, though the Connexus team handled complex challenges and contractor relationships well. Various tailored solutions were developed to suit the conditions of each architype and property. In Sandpits it was challenging to develop a new contractor relationship on an innovation project.

A project steering group and board with individual from relevant departments were established ensuring the right governance structures were put in place. The steering group could perhaps have played a more active critical friend role. Major issues were escalated to the project board who provided appropriate oversight though its expertise could, perhaps, have been drawn on more.

Connexus has strong management processes for financial reporting/decision making and one clear point of contact throughout the programme which was appreciated by delivery partners. Its 'flat' communication structure offered a supportive, learning environment. New information, questions and project changes were communicated in a timely manner via frequent team meetings. Clear and consistent messages were agreed and relayed to tenants via regular updates.

*"I can go directly to anybody. I don't speak to the board, but I can go directly to anybody up to Chief Executive if I want to talk about something and it [Connexus] operates very much like that. That's very helpful. They take responsibility and acknowledge when things have gone wrong and learn from the experience...and there's a real willingness to sort things out but no blame. Yeah. It's refreshing. It just means that you can move on to the next challenge."*

With such a complex project there were some delivery issues that arose that had to be dealt with:

- The shift from energy efficiency support to Warmer Homes required new project budget codes which meant some retrospective work to ensure the correct audit trail was in place.
- Some delays accessing timber at the start of the project as a result of the Pandemic.
- Working with utilities was challenging. BT Openreach cables had to be extended to accommodate the external wall insulation which caused a delay of a few months impacting on the start date of some subcontractors and the availability of the roofer who was lined up.

The principal contractors and wider management team had good working relations with meetings on site and agreement with subcontractors around design details and any changes.

*"The working relationship between us and Connexus was very good, if not excellent in terms of how we dealt with things with on site. Any issues were dealt with straightaway." Contractor.*

In Hereford the contractor worked with local subcontractors who knew the area well and also sourced materials locally. Good working relations meant any local challenges could be ironed out. Plans have been made to use the same subcontractors on Connexus' next project at Riverview. An effective working relationship is now being developed with new contractors on the Shropshire site.

#### 4.7 MONITORING AND EVALUATION (MEA PERSPECTIVE)

As noted, baseline data was collected by MEA on homes in Hereford that were to be retrofitted. This helped gain insights into the impact of the changes being made. Data was collected over a longer period than expected due to a delay in the Programme's start.

*"We were gathering millions of lines of data-on-data loggers. We wanted to gather quantitative data about temperature and humidity, longitudinally over a period of a year because we wanted to span a winter and a summer season."*

*"They met volunteer residents three times in the process. And the good thing about that was that they were seen as independent so if they'd got issues, they felt they couldn't report to Connexus or hadn't been addressed by Connexus they could bring them up with MEA."*

It turned out that around 41 of the homes of which detailed engagement took place, were subsequently taken out of the Programme. This was due to a number of issues including planning comments, timescales, Connexus investment priorities and modelling issues (not reaching the standard the Programme was seeking to reach).

A new monitoring and evaluation methodology was developed to monitor performance results of the retrofitted homes. Evaluators engage with tenants over the period of a month to take snapshots at different points in time to be able to directly compare before and after. The data is largely quantitative which is easily comparable with the intended thermal performance results. The results showed that the retrofitted homes performed very well in terms of thermal performance.

There were some difficulties which arose when trying to monitor performance results due to the different methods used for bill payments, however, algorithms for the new monitoring model help to address this.

*"It would be great if we could have done that right from the start, but the algorithms have only been developed recently."*

## 5 STRENGTHS, WEAKNESSES AND LESSONS LEARNT

This section reflects on strengths, weaknesses and lessons learned that have emerged from the evaluation.

### 5.1 PROGRAMME STRENGTHS AND WEAKNESSES

#### STRENGTHS

The main strengths including the following:

- **Strong contractor working relationship** – Working with known contractors helped smooth Programme delivery and complete the works in line with the Enerphit pathway.
- **Impact of the Tenant Liaison Officers** - The development of TLO-tenant rapport was significant in bring tenants on board with the planned changes. The TLO's co-ordination of subcontractor's works and up-to-date communications with tenants was a significant part of the delivery.
- **Improving the energy efficiency of homes** - The success in the delivery of the Programme is evident in the programme's achievement of improving the energy efficiency of the homes. Despite the changes made to the stock of buildings being improved and the approach used, the key objectives of reaching carbon savings targets have still been achieved. Learning from the Project will inform Connexus' pathway to net zero.
- **On-site PHPP consultant** – The PHPP consultant carried out the modelling of the Project and was on-site to sort any issues with installation. They worked alongside the contractor to ensure standards are being met. This was a useful step toward ensuring objectives are fulfilled.
- **Marches Energy Agency** - Their independent role and expertise has resulted in successful engagement and monitoring exercise. There is a careful balance to strike between informing and engaging tenants and raising expectations. Some neighbouring privately owned properties were affected by the works' disruption which required some work to get them on board.
- **Reaffirming the fabric first approach** - The project has reaffirmed the fabric first approach to retrofit and there is a better understanding of Connexus' potential offering to customers. The Enerphit pathway will ensure Connexus and partners are able to meet EnerPHit in the future.
- **Internal commitment from Connexus** has been extraordinary for this pilot and worked well.

#### BARRIERS AND WEAKNESSES

The principal barriers and weaknesses were as follows:

- **Pre-and post-procurement challenges** were experienced including Covid, the UK's Exit from the EU and the government stimulus investment post covid. For instance, initially there were few interested bidders perhaps reflecting workload/capacity issues on the bidders' side and there were difficulties in getting and retaining sub-contractors on-site.

- **There are gaps in knowledge and understanding** of Enerphit standards and requirements amongst architects, designers and installers.
- **Relationship with new contractors was not as strong** as older contractors which has affected timescales and delayed progress. There is opportunity to build relationships with current contractors to ensure better and more effective communication on the works' specifications.
- **Working with utilities** including BT, Cadent and Western Power Distribution has been time consuming and collectively have caused some significant delays.
- The **unit costs were much higher than expected** and it was hard to complete them all within the ERDF timescales. Building material costs increased since the bid which made budgeting difficult.
- **Changing plans** for which stock archetypes were to be retrofitted and which were eligible for ERDF funding took some time to finalise.
- **With so many partners involved clarity around roles** will avoid any confusion.
- **Logistically phasing has been a complicated.** The ambition in Sandpits was to address voids but ERDF timescales meant these couldn't be upgraded in time to decant people.

## 5.2 LESSONS LEARNT

The lessons learned have emerged from the discussions with stakeholders and delivery partners:

### FOR CONNEXUS HOMES LTD

- Connexus has learnt that achieving Enerphit standards is a highly beneficial but expensive process and can't easily be automatically rolled out as local property conditions, archetypes, and settings play an important role in determining the right approach.
- Connexus will be doing more pilot work to better understand what sort of EPC standard and investment are required for its properties to remain on the path to net zero. This will ensure it can take a fabric first approach in an affordable manner.
- It has also learned lessons around phasing and supplier knowledge and engagement (see next section). For instance, early engagement of internal teams and external partners including planners and utilities is a key lesson to avoid excessive delays.
- Ensuring project steering groups play an active critical friend role and the expertise of project boards' is drawn on is a lesson for future projects.

### FOR THOSE DESIGNING AND IMPLEMENTING SIMILAR INTERVENTIONS

- Consider a baseline study of tenant circumstances and ongoing pre and post works monitoring (temperature, energy use etc) to ensure benefits/outcomes can be measured.
- The preparation phase is important. Getting detailed design work undertaken prior to going out to tender is more efficient and cost effective than afterwards.

- Ensure you communicate the requirements and specifications at an early stage with contractors and ideally conduct an expression of interest stage or some soft market testing. Connexus did a whole event on soft market testing before launching the Sandpits tender.
- Contractors need seamless and early engagement with design teams and to be involved in technical meetings, especially with the move to new standards.
- Experience from Connexus suggests that specialists in the delivery and procurement are worthwhile investments otherwise it will be a very steep learning curve and can be expensive learning lessons on the job.
- Some cost contingency is advised for Enerphit projects in case of unknowns, procurement challenges and/or delays.
- Building a strong relationship with the contractors will help smooth the delivery process and ensuring that any emerging issues and challenges can be collectively addressed is important. Consider a competitive dialogue approach.
- Tenants need to be made aware of energy efficiency cost savings and the transformational capacity of a fabric first approach to help tackle damp, mould, poor air quality and the effects of fuel poverty in social housing. A combination of tenant engagement approaches may be needed and a strong presence on site is advisable to build good rapport.

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#### FOR POLICY MAKERS

- It is worth noting that revenue funding is needed to manage retrofit projects effectively. For instance, to prepare the procurement team and get them fully up to speed with the Enerphit standards, requirements and delivery priorities.
- Retrofit is a long and complex process that requires political support, multiple funding streams and long-term investment and commitment.
- There is a need for (a) much better understanding of Enerphit standards amongst contractors and some social housing providers as well as awareness of the potential non-technical barriers such as tenant engagement, planning, tenure mixes and phasing, and working with utilities. (b) more funding and systematic promotion of Enerphit standards and their benefits (noted above). The policy and regulatory framework for achieving Enerphit standards needs to be more sophisticated and stimulatory.
- There should be more widespread dissemination and development of new technologies to support Enerphit development. For instance, guidance on when and how to introduce new technologies on a 'fabric first' approach would be helpful.
- Investment is required in construction skills and education around the requirements and design standards to achieve Enerphit objectives for instance.

## ANNEX ONE: STAKEHOLDERS AND DELIVERY PARTNERS

Name	Position
Rosemary Coyne	Co-ordination & Compliance Manager, Connexus Homes Limited
Phil Newcombe	Project Manager, Marches Energy Agency
Sarah Price	PHPP Consultant, Qoda Consulting
Tony Jones	Head of Assets, Connexus Home Limited.
Jayne Bissell	Procurement Manager, Connexus Homes Limited.
Robert Weale	Contract Manager, Connexus Homes Limited.
Steve Roberts	Contract Manager, SBS
Hayley Dickinson	TLO for Hereford, Connexus Homes Limited.
Katie Shock	TLO for Sandpits Shropshire, Connexus Homes Limited
Lesley King	TLO for Hereford, Connexus Homes Limited.



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