TURNING HOUSING INTO HOMES FIT FOR 2050
Good quality housing is the cornerstone of a flourishing community. It needs to be affordable to run and maintain, support good mental and physical wellbeing, and be located within areas that are physically well connected to the places people want to go, and which foster social connection and equity of life opportunities.

To understand how investment outcomes in housing can be managed to create and maintain a high quality UK housing stock, the Sustainable Housing Action Partnership (SHAP)\(^1\) investigated five questions in three workstreams.

- **SHAP new build healthy homes standard**
  - 1. What are the relevant standards for a high quality, healthy, energy efficient home fit for 2050?
  - 2. How much will this cost?

- **SHAP smart and sustainable procurement model**
  - 3. How can value for money and long term outcomes from investment in housing be assured?

- **SHAP finance model for financing the refurbishment of existing homes**
  - 4. What are the finance options supporting investment in the UK housing stock to address fuel poverty, carbon emissions reductions and energy efficiency targets?
  - 5. What are success factors behind good project outcomes?

\(^1\) www.shap.uk.com
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RESEARCH REPORT 3
SMART AND SUSTAINABLE PROCUREMENT MODEL

RESEARCH REPORT 4
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FOREWORD

We wouldn’t accept a cold restaurant meal or a car that used three times as much fuel as it was supposed to without feeling justified in making a complaint. It is unclear why we accept housing that isn’t as comfortable, healthy or energy efficient as it should be despite housing costs forming an average of 18%\(^2\) and up to 79%\(^3\) of our expenditure.

Housing is a major determinant of our health and wellbeing, our capacity to study and work and there is growing evidence of the costs to the economy and to society of poor quality housing (existing and new build). However, there are significant opportunities to improve value for money from housing investment IF decision making and delivery processes can be improved.

The housing sector must secure the very best outcomes from investment in both new housing and in our existing homes - not just on the day the project is completed, but for every day in which the home is lived.

Finally, research is only worth doing if it leads to something. Since this research was published in July 2018, it has been used to:

- inform healthy housing standards for incorporation into the emerging Design Charter principles for the West Midland Combined Authority.

It has led directly to:

- securing £250,000 to resource the feasibility stage of a proposed three year, £150m fuel poverty programme for the West Midlands.

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\(^2\) [https://www.ons.gov.uk/peoplepopulationandcommunity/housing/bulletins/housingaffordabilityinenglandandwales/2017](https://www.ons.gov.uk/peoplepopulationandcommunity/housing/bulletins/housingaffordabilityinenglandandwales/2017)

PREAMBLE

The SHAP research in 2018 was undertaken to understand how investment in housing could deliver more certainty of long term positive outcomes.

The research addresses issues relevant to:

- new build housing
- the existing housing stock
- all tenures

The research responded to evidence of continuing systemic issues such as:

- fuel poverty (people unable to afford to heat their homes properly)
- the performance gap (new homes that don’t actually meet Building Regulations standards)
- the links between poor housing and placemaking on mental and physical wellbeing, for example: the impacts of existing poor housing and of car dependent new housing estates

The research summarised in this report and ongoing activity resulting from the research is supported by a large number of SHAP Members and industry leaders who attended workshops in the West Midlands. However, the findings are not restricted to use by West Midlands authorities and others are invited to take a look and help test the research and refine findings by providing further evidence.

It is hoped that this research will be of benefit to all stakeholders in the housing sector but should be of particular interest to those involved in investment decisions, policy making and project delivery.

The research findings are available freely to all in the housing sector and are disseminated at SHAP events and beyond. The research reports can be found at: www.shap.com/research. The research information will be further developed and updated as context changes and more information becomes available.

The opinions expressed in this report are those of the authors alone, and do not constitute any endorsement of the recommendations, products or services contained herein by any of the individuals or organisations named in this report

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SECTION A: RESEARCH BACKGROUND, HEADLINES, RECOMMENDATIONS, IMPACT, NEXT STEPS

1.0 WHY THE RESEARCH WAS UNDERTAKEN

Housing is a critical part of our national infrastructure. Each year, the UK spends an estimated £40 billion (of which about £21bn is on new build, ONS, 2018) on maintaining, upgrading and building housing. Yet this investment does not always deliver the intended outcomes although the beneficial impacts of a national high quality, healthy housing stock are wide ranging from health to economic development.

Figure 1 - 'Delivering Healthy Housing' published in May 2018

The research summarised in this report was proposed by housing sector practitioners who are trying to deal with the impacts of poor quality housing and new build housing targets and deliverability.

Crucially, however, there is a rare opportunity at this time to address current housing issues through responding to several different drivers for change to create a completely new approach to specifying, procuring and financing housing investment.

**Figure 2 - Drivers for Change**

**Drivers for change - Issues including:**
- Impacts of poor housing on health and wellbeing (physical and mental)
- Fuel poverty
- Homelessness
- Speed, quality and affordability of new housing
- Lack of construction skills
- Lack of finance
- Growing incidence and duration of extreme weather

**Drivers for change - Opportunities including:**
- Rapid changes in the UK energy system
- Review of Building Regulations following Grenfell
- The Construction Sector Deal and Devolution deals for housing and land remediation
- Whole place low carbon and circular economy agenda
- Communications and Artificial Intelligence advances
- Electric Vehicles

**Drivers for change - Principles and Assumptions**
- Radical change is required to deal with the worst housing stock in Europe
- There is a desire to improve outcomes from investment in housing
- Investment in housing should be treated as infrastructure investment
- New regulation will require better outcomes from investment in housing

**Drivers for change - Previous SHAP research**
- 2009 - Beyond Decent Homes (a costed model for including energy efficiency retrofit to an agreed performance standard as part of the Decent Homes programme delivery)
- 2010 - Community Green Deal (the building blocks and financial models for area based regeneration programmes)
- 2012 - People’s Power Station (The smart way of managing electricity supply and demand)
- 2013 - Success Factors in Delivering DECC funded projects
2.0 IMPACTS OF POOR HOUSING

The link between poor housing and adverse effects on health, society, finances and the economy are well documented.

2.1 The Health and Wellbeing Costs of Poor Housing

Poor housing leading to health impacts has both:

a direct cost on public services – e.g. hospital treatment for example

an indirect cost – e.g. days lost to work through ill health and additional childcare needs

As one example, a Shelter report (2006)\(^6\) highlighted the following as potential health effects on children:

- *Up to a 25% increase in the risk of severe ill-health and disability during childhood and early adulthood*
- *Increased risk of meningitis and asthma and slow development which is linked to coronary heart disease*
- *A greater chance of suffering mental heath problems and problems with behaviour*
- *Lower educational attainment and a greater likelihood of unemployment and poverty*

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\(^6\) “Chance of a lifetime: The Impact of bad housing on children’s lives”. (Shelter, 2006)

A BRE briefing\(^7\) from 2015 calculated costs to the NHS of £1.4bn/year due to poor housing using data from the 2011 Housing Health and Safety Rating System (HHSRS), combined with information from the NHS on treatment costs. Shelter and MIND have both recently reported on the mental health impact of poor housing.\(^8\)

An NHS briefing from November 2018\(^9\) states:

**Good quality housing is critical to supporting wider determinants of health by:**

- *Promoting good wellbeing and helping to combat loneliness;*
- *Providing a secure and settled place to live which can aid the recovery of people with mental illness;*
- *Reducing the incidence of respiratory diseases and other conditions;*
- *Reducing and delaying demand for health services by enabling people to be independent for longer in their own home, meeting their changing needs;*
- *Allowing people to be discharged from hospital when they are fit to go home;*
- *Keeping people out of hospital or helping them to return home quicker with the right adaptations and support*

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\(^7\) [https://www.bre.co.uk/filelibrary/pdf/87741-Cost-of-Poor-Housing-Briefing-Paper-v3.pdf](https://www.bre.co.uk/filelibrary/pdf/87741-Cost-of-Poor-Housing-Briefing-Paper-v3.pdf)
\(^8\) [https://england.shelter.org.uk/__data/assets/pdf_file/0005/1364063/Housing_and_mental_health_-_detailed_report.pdf](https://england.shelter.org.uk/__data/assets/pdf_file/0005/1364063/Housing_and_mental_health_-_detailed_report.pdf)
\(^9\) [https://www.mind.org.uk/information-support/guides-to-support-and-services/housing/#.XFav9_Z2s2w](https://www.mind.org.uk/information-support/guides-to-support-and-services/housing/#.XFav9_Z2s2w)

2.2 Fuel Poverty and Poor Housing

An obvious effect of poor housing in terms of the direct financial impact on households is the need to spend a greater proportion of household income on fuel for heating. Fuel Poverty is a particularly acute issue in the West Midlands - the region has the highest fuel poverty rate in England, with 13.7% of households – a total of 315,000 – estimated to be fuel poor. In other words, one in eight households in the region face physical discomfort from damp, cold homes or difficult choices, for example having to choose between heating and eating.

Fuel poverty in England is measured using the Low Income High Costs (LIHC) indicator\textsuperscript{10}. Under the LIHC indicator, a household is considered to be fuel poor if:

- they have required fuel costs that are above average (the national median level)
- were they to spend that amount, they would be left with a residual income below the official poverty line

There are 3 important elements in determining whether a household is fuel poor:

- household income
- household energy requirements
- fuel prices

The quality of housing is a significant factor in the benefit from spend on energy. Improvements to housing may not reduce energy bills for the fuel poor but the money that is spent after energy efficiency work can dramatically improve the levels of comfort and quality of life.\textsuperscript{11}

- \textit{Long-term exposure to a cold home can affect weight gain in babies and young children, increase hospital admission rates for children, and increase the severity and frequency of asthmatic symptoms.}
- \textit{Children in cold homes are more than twice as likely to suffer from breathing problems, and those in damp and mouldy homes are up to three times more likely to suffer from coughing, wheezing and respiratory illness, compared with those with warm, dry homes.}
- \textit{Struggling with high energy bills can have an adverse impact on the mental health of family members. Fuel poverty may even affect children’s education – for example, if health problems keep them off school, or if a cold home means there is no warm, separate room to do their homework.}\textsuperscript{12}

\textsuperscript{10} https://www.gov.uk/government/collections/fuel-poverty-statistics
\textsuperscript{12} http://www.poverty.ac.uk/report-child-poverty-fuel-poverty/’severe-effect’-fuel-poverty-children
Figure 3 – Aspects of energy use for those in fuel poverty

I spend £600 a year on energy

- I can't afford to heat the whole house. I live in one room in the winter.
- I am still cold

I don't use my heating

- I still pay a standing charge but get nothing for this
- I have had my gas supply capped as I never use the heating system
3.0 NEW BUILD HOUSING ISSUES

As well as demand for new housing exceeding supply, there is growing evidence that new build housing is not always as good as it should be. Examples of complaints about multiple defects found in brand new houses are growing. There is also continuing monitoring of the energy performance of new build homes and evidence of a number of issues affecting their comfort levels and cost to run.

Recent reports are also highlighting issues of poor connectivity and missed placemaking opportunities.  

A Parliamentary Briefing Paper published in December 2018 considers the existing building control regime and customers’ means of redress when faced with defects in newly built housing. It summarises the findings of the All Party Parliamentary Group’s inquiry and recommended actions.

“A good deal of political attention is focused on the need to increase the rate of house building, but alongside this are growing concerns about the quality of the houses under development. MPs are encountering constituents who have bought new homes, and who are struggling to achieve satisfactory resolution when defects are reported to builders.”

3.1 The Performance Gap Between What Building Regulations Require and What Is Built

In 2014, the Zero Carbon Hub published its findings on the difference between designed performance and the actual performance of buildings. The report set a target of 90% of all new homes demonstrating they met or exceeded the Building Regulations standards applying at the time of the construction.

However, there is continuing evidence that despite the Zero Carbon Hub research, some new homes are not meeting the standards to which they are designed (the ‘performance gap’); some new homes also exhibit some of failings of existing housing stock with the same resulting problems, for example condensation and mould. The well reported absolute shortage of new homes has prompted the need for faster delivery of new housing stock delivered by focussing on stalled sites and offsite manufacturing. This push for rapid delivery of housing at a time when some existing developments are not up to standard increases that risk that a proportion of new housing stock will not be fit for purpose today or into the future.

“I am pleased that a national company has finally accepted that the build quality has been unacceptable on the properties. Although potential compensation is brilliant it will never fully cover the turmoil that these residents have suffered.” 2016

4.0 EMERGING ISSUES FOR NEW AND RETROFIT HOUSING

1. Future change will present new challenges for the UK housing stock, for example,
   a. increased extreme weather events and the need for cooling as well as heating
   b. indoor air quality concerns
   c. an aging population
   d. changing energy infrastructure needs

2. A continuing “performance gap” issue will mean that too many homes built today are not meeting basic regulatory standards and will require substantial investment to retrofit them in the near future.

3. The construction industry is also facing challenges of skills and materials shortages. Offsite manufacturing of new homes is seen to be an answer to cost, quality, delivery times and skills shortages. The supply chain is responding to this opportunity but is still immature and is waiting for clearer guidance and consistency on aspects such as indoor space standards and energy performance requirements from different clients.

The tragedy at Grenfell tower highlighted a number of issues regarding decisionmaking about investment in housing. Amongst these are fire risk; cost v value and the fundamental importance of making decisions with those most involved including householders, asset managers and tenants. Updated Building Regulations are being developed.

The review of retrofit projects reported in the Each Home Counts has led to a new standards being produced to assure quality in housing retrofit including PAS 2035. The report recommends more training for different roles involved in housing projects.

"Examples of exemplary performance in installing energy efficiency measures have been highlighted, two of which are presented in the industry chapters of this Report. However, too often interventions are not well-targeted to suitable properties and, in a minority of cases, there is poor practice and sub-standard work being carried out."

Trusted trader schemes are improving the confidence of owner occupiers to undertake energy efficiency projects but the market is currently very small.

5.0 OPPORTUNITIES TO CHANGE BUSINESS AS USUAL APPROACHES TO HOUSING INVESTMENT

There are national drivers for changing ‘business as usual’ including Building Regulations changes arising from the Grenfell Enquiry which are designed to improve outcomes from housing projects. A new standard for energy efficiency retrofit projects (PAS 2035) is being developed. Pressure continues for rapid delivery of 1 million new homes and development of a new supply chain for modular housing.

There are a number of initiatives underway which can contribute to driving improved housing stock; some of the most relevant to this research are shown below, particularly those most involved in the West Midlands region:

- **The Industrial Strategy, Local Industrial Strategies and the Housing Sector Deals** have identified the importance of housing and the construction sector to economic growth.
- **Total cost of occupation** approaches to housing finance are using long-term financial modelling to include not only the initial costs of investment but also the ongoing maintenance and the day to day running costs. These models support investing more up front to secure long-term cost savings and quality outcomes.
- **The energy system transformation** is a driver for investigation of new energy generation and storage opportunities which should benefit local economies and householders.\(^{18}\)
- **The West Midlands Combined Authority and Homes England** are developing healthy homes and high-quality placemaking standards as part of their requirements for allocating/granting public funding.
- **The Black Country Garden City principles** and accreditation process support high-quality housing development.
- **Public health** officers are developing and applying healthy homes standards as part of a health and wellbeing approach to policy and project development.

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\(^{18}\) This is the move away from central generation of energy, transmitted by line – often from highly polluting plants, to local production of energy using cleaner technologies.
5.1 Economic Benefits from Investment in Housing Include:

**NHS Savings**
It is estimated that a spend of £10 billion on the poorest homes would save £1.4 billion a year on NHS costs, giving a 7 year pay back period with the benefits of the further avoided costs after that period.

**Local Economic Development Opportunities**
This is an opportunity for local economic development with SHAP research in 2012 identifying that £106 billion of investment over was required for all tenures of housing on basic insulation installations, boilers and windows. RICS estimated the size of the construction sector’s multiplier at £2.84 – which is one of the highest multiplier effects in any sector of the economy. (2010)
6.0 BARRIERS TO CHANGE

With the underlying principles in place, and an understanding of some of the potential drivers to change, workshop attendees identified a number of key barriers that must be addressed before a new regime could be introduced that would achieve better and more predictable outcomes from housing investment.

The concerns of those directly involved in roles across the housing sector were recognised to ensure that research outcomes were relevant to their needs.

The barriers to changing current investment practices were grouped into three themes, although it should be noted that there is overlap between and within the groups.

6.1 Financial, Economic and Policy Barriers

1. The outcomes from investment in housing currently often do not offer value for money. In some cases, investment can have negative effects on key indicators.
2. Lowest cost dominates procurement and is not the same as value for money.
3. Continuously unpredictable policy and grant funding initiatives impact the supply chain capacity distract from a steady pathway to improving the housing stock quality and performance
4. Lack of investment in existing stock, especially owner occupiers and the private rented sector.
5. Existing budgets managed in silos that do not encourage investment in housing to deliver the multiple benefits to other budget holders arising from better housing

6.2 Procurement and Management Failings

1. Learning from investment is not routine and where there is learning it is often not carried forward into subsequent strategies, programmes and projects.
2. Innovative low carbon housing pilots are not resulting in transformation of the market – ad hoc pilots are not creating sufficient scale for the supply chain to invest in changing their offer
3. Skills gap at all levels of the value chain and lack of leadership much of the time\(^{19}\)
4. Slow adoption of new procurement practices which could achieve better long term value and social value from investment in housing

6.3 Lack of Demand for Healthy Living and Affordable Lifetime Housing Costs

1. Lack of consumer demand for high quality, healthy, energy efficient, affordable to run housing

2. Severance between discussions on:
   - economic growth
   - energy supply
   - health and wellbeing
   - targets for new build housing
   - potential triple bottom line\textsuperscript{20} opportunities from investment in housing (new build and retrofit)

\textsuperscript{20} Environmental, social and economic
7.0 RESEARCH HEADLINES

The SHAP research investigated four barriers to the creation of a high quality healthy housing stock in the UK:

- inconsistent quality outcomes from investment in housing
- different practices and standards across the housing sector
- perceptions of lack of finance available to the housing sector
- uncertainty about what a high quality, healthy home ‘looks like’

Three workstreams were established to:

1. Define what standard should be applied
2. Demonstrate how procurement can be used to deliver outcomes with long term benefit
3. Confirm the finance streams to fund investment focussed on high quality, long term outcomes

7.1 Research Reports

In total five reports were produced:

1. New build healthy homes performance standard
2. Costs for enhancing new build homes energy performance
3. Smart and sustainable procurement model
4. Success factors in planning and delivering retrofit projects
5. Finance models for retrofit

A short precis of each report – containing results, conclusions and recommendations – can be found in SECTION B. The full reports are available from the SHAP website.
www.shap.uk.com/research

The research papers and models produced under this research provide guidance and tools for the housing sector in response to the imperative to use available funding better. They also contribute to the evidence to support the creation of new finance models and funding streams that address the whole housing stock.
7.2 Key Findings – Opportunities for Improving Practice

SHAP research found that there is the both a need, and great opportunity, to manage investment in housing in a completely new way. The quality of housing is an important determinant of health and wellbeing outcomes and a strong base for the economic performance of individuals and communities. If new approaches to design quality, finance and procurement are adopted, high quality healthy housing in high quality places is:

Affordable       Deliverable       Achievable

7.3 Factors Affecting Long Term High Quality Outcomes from Housing Investment

Currently, systemic failures are impacting on the success of securing desired outcomes from investment in housing for both new build and the existing housing stock, for example:

- there is still an issue with (10- 40%) housing failing to meet the Building Regulations applying at the time of construction, representing a huge waste of money and the consequent higher demand for energy than modelled (to heat and cool homes).

- information gaps need to be addressed, particularly:
  - what performance standards are actually being achieved by new housing and in housing retrofit schemes
  - what the costs are for improving standards beyond the basic regulatory minimum

- there is lack of consumer demand for healthy, energy efficient homes

- lowest cost rather than value for money continues to drive decisionmaking: affordable is taken to mean the price at point of construction or project delivery rather than affordable over the total life of the home
7.4 Factors Supporting New Approaches to Housing Investment

1. There are significant financial, social and environmental opportunities from reviewing ‘business as usual’ approaches to housing design, procurement and management in order to reduce risks of unpredictable outcomes/costs associated with housing projects and to secure long term value from housing investment.
   a. early market engagement with the supply chain can result in better value and also lower cost solutions
2. The importance of housing as a wider determinant of health and social outcomes is increasingly recognised with demands from public health and others for new attitudes towards investment in our housing stock
3. There is sufficient opportunity within existing regulatory frameworks for ‘procurement for outcomes’ to happen immediately.
4. Investment in housing fabric and active ventilation strategies do result in greater comfort for occupants. Such investment may not reduce energy bills but does help improve quality of life and life outcomes.  
5. There is a demand for consistency over housing standards particularly from modular supply chain companies
6. A commitment to quality and long term outcomes must be supported by rigorous decisionmaking and project/programme management systems
7. Contrary to many people’s perception, money need not be the showstopper when it comes to delivering higher housing standards. If housing investment is treated in the same way as investment in other national infrastructure assets, then we can build affordable finance packages that deliver lower total costs of occupation for householders and lower risk/improved outcomes for investors.
8. New financial models are being tested which:
   a. offer new ways of financing long term outcomes rather than short term outputs
   b. can now address the split incentive and allow capital costs for enhanced quality and performance to be recovered by investors whilst also allowing occupants to benefit from revenue savings and greater comfort.
9. There is finance available to all tenures to support whole house energy efficiency retrofit and evidence from the Netherlands shows that costs do fall as the pipeline grows.

22 www.energiesprong.eu
10. Energy system transformation\textsuperscript{23} is driving change in heating and power solutions for housing and providing financial opportunities for housing developers and asset managers (including private owners).

\textsuperscript{23} The UK energy system is being transformed and is moving from centralised, polluting and inflexible generation and distribution to decentralised, more flexible, cleaner and more local distribution. This offers financial opportunities as well as routes to cleaner energy.
8.0 RECOMMENDATIONS

Some areas of research focus have been overtaken by new issues since they were first identified by SHAP members e.g. the energy system transformation and research into local generation and storage has overtaken issues about PV installation solely. In other areas the existing regulatory framework is already robust e.g. procurement focussed on value for money and long-term outcomes. There are also many examples of outstanding housing projects delivering fantastic outcomes. Despite this there are still unpredictable and systemic failures. Therefore, the starting point for the housing sector to achieve consistently high value outcomes from in housing is the embed widespread awareness and training to drive a commitment to adoption of robust decision and delivery processes and continuous learning. The SHAP research confirmed a number of necessary conditions and recommendations to support transformation of outcomes from investment in the UK housing stock.

Figure 4 - Necessary conditions to secure better housing investment outcomes

- **Aware Client**: Housing providers must take responsibility for developing the leadership, knowledge and oversight needed to drive up housing quality.
- **Feedback loops**: Robust processes, monitoring and evaluation are essential to allow housing providers to play the role of the Aware Client successfully.
- **Future planning**: Opportunities should be taken to create a flexible approach to housing investment e.g. adding hooks into masterplans or planning policy that help accommodate change and secure better outcomes.
8.1 Recommendation 1 - Embrace Systemic Change

The SHAP research confirms that systemic change is needed in housing and construction project design, financing and management and has found these can be overcome through adoption of robust processes focussed on long term outcomes.

This report recommends systemic change - *change that pervades all parts of a system, taking into account the interrelationships and interdependencies among those parts.*

Three principles are considered to be non-negotiable if systemic change is to occur and investment is to achieve better value outcomes for new build and existing housing.

1. **Housing must be regarded as a critical part of the UK physical and social infrastructure**
2. **Long term outcomes and total cost of occupation must drive investment decisions**
3. **Action must start now, using current regulatory and policy framework to plot to a trajectory to create a UK housing stock fit for 2050**

8.1.1 Next Steps in Changing The System

1. Improve the definition and delivery of housing investment projects and programmes
2. Develop new financial models supporting affordable, long term outcomes from investment in high quality, healthy homes and places
3. Define the pathway from current Building Regulations and other regulatory criteria to a home fit for 2050

The most important success factor is a robust, end to end process for defining investments, managing the procurement and delivery, monitoring and evaluating outcomes and feeding back learning into the next investment.
8.2 Recommendation 2 - Changing Decisionmaking Habits

8.2.1 Total Cost of Occupation Objectives

Taking a ‘total cost of occupation’ approach means that long term outcomes are taken into account as part of value for money appraisals. Total cost of occupation also means that there is scope for a return on investment for any additional initial capital costs to be secured over a (say) 30 year period.

8.2.2 Feedback Loops and Organisational Learning

There is scope to improve organisational and sector learning by taking programme level approaches to monitoring, evaluation and use of learning to inform further decisionmaking.

8.2.3 Creating Level Playing Fields – Policy and Standards

There is a need to provide a simple summary of existing standards and good practice support a consistency of approach, create a level playing field for housing sector suppliers and determine the most cost effective pathway to 2050 homes standards. There is a large amount of technical and policy information available; new information, standards and evidence about emerging issues to be addressed continue to be produced; policy changes drive change and can change the focus of housing sector activity. Factors the housing sector needs to take into account include:

- the Housing Standards Review in 2015 and the revision of the National Planning Policy Framework (NPPF) in 2018
- the pullback on requiring zero carbon energy standards for housing through the 2016 Building Regulations
- the introduction of the Nationally Described Space Standards (NDSS)
- the current review of Building Regulations and power of housing occupants since the tragic Grenfell fire
- the imminent publication of the new PAS 2035 standards to improve outcomes from work on housing and Energy Capital proposals for investment to address fuel poverty
• the new standards for modular construction and the emerging West Midlands Combined Authority Design Charter and single commissioning framework
• the ongoing local planning policy review programme for each local authority
• the continuing impact of austerity on the capacity for housing sector organisations to deal with an increasing workload of existing housing condition; the health and wellbeing being, homelessness and loneliness agenda; the need to unlock new build delivery

8.2.4 Cross Disciplinary and Departmental Collaboration and Co-ordination

There needs to be cross disciplinary/ cross departmental co-ordination in order achieve the best value for money from housing investment including:

• Housing regulation
• Housing management
• New build housing delivery
• Planning
• Finance
• Procurement
• Public Health
• Social care
• NHS
• Devolved authorities including the West Midlands Combined Authority
• Construction supply chain
• Low carbon supply chain
• Energy and water utilities
• Communications companies
• DWP (Universal Credit Rollout)
9.0 NEXT STEPS BY THE HOUSING SECTOR TO IMPROVE OUTCOMES FROM HOUSING INVESTMENT

1. Confirm housing as one element of our national infrastructure and invest accordingly for long term outcomes – long term, largescale programmes of investment
2. Consider housing within whole place solutions
3. Make use of existing regulatory frameworks and tools/guidance to drive up the predictability and value of long term outcomes from investment in housing.
4. Understand the potential for the supply chain to provide more value if they can be given the opportunity to do so by completely overhauling procurement processes
5. Test and develop the new financial models that are available, providing return on investment for capital spend to deliver increased quality and performance for both the new build and existing housing stock
6. Take advantage of the transforming energy system and digital offer
7. Plan for change – increased weather impacts, demographics, connectivity, energy system – and do not preclude the opportunities for future investment i.e. make sure wherever possible prohibitive costs to improve housing are designed out
8. Invest in skills and training across the whole supply chain from client to maintenance services
9. Take immediate action to address issues such as the performance gap of new housing and issues in some retrofit projects
10. Invest in monitoring and evaluation and carry findings back into feedback loops
11. Acknowledge that the best partners in a housing project are those who live there, they know their houses and their lifestyles but can also be completely unpredictable and perverse in their maintenance, energy and technology management.

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24 A new standard is currently being developed to support better retrofit project design and delivery
10.0 RESEARCH IMPACT - OUTCOMES TO DATE

The SHAP research is being used to inform a number of topic areas including:

➢ Fuel Poverty
➢ Health and Wellbeing standards for new homes and whole place solutions for healthy outcomes
➢ Modern Methods of Construction (MMC) / Offsite Manufacturing (OSM)
➢ Construction skills agenda
➢ Inclusive Growth
➢ Planning policy review – e.g. Black Country Core Strategy

10.1 Influencing and Informing New Criteria For Delivery of a £150m West Midlands Wide Fuel Poverty Programme

The emerging research findings were launched at the SHAP conference in May 2018. As a direct outcome of the conference recommendations, SHAP reconvened the West Midlands Fuel Poverty Working Group. The group has met several times and is working with the West Midlands Combined Authority Energy Capital initiative on a proposal for a 3 year £150m programme to tackle fuel poverty supported by Government and the West Midlands mayor. The programme will pilot approaches to the design of ECO 4\(^25\) and will report to BEIS and Ofgem.

The programme will take a person centred approach to advice and investment in housing retrofit with the aim of maximising outcomes for those in fuel poverty in all property tenures. A budget of £250,000 was been approved by the WMCA in early 2019 to fund the development phase of the programme, which is expected to start in April 2019. The programme will be informed by and further develop the SHAP research into finance models for retrofit and will include practices recommended by the research of detailed survey and engagement as part of the process. The quality of outcomes will be informed by the SHAP smart sustainable procurement model, also drawing on case studies such as Energiesprong and Warmworks Scotland identified as part of the SHAP research.

\(^{25}\) This will replace ECO 3 in 2022. ECO is the Energy Company Obligation. 
10.2 Informing the Quality of 215,000 New Build Homes

The research participants strongly recommended that new build housing should adopt standards supporting the development of high quality, HEALTHY homes. The SHAP standards have been shared with organisations across the West Midlands since July 2018. Public Health organisations and the offsite manufacturing supply chain are particularly interested in the SHAP research into standards for new housing: the research outputs have been recognised as useful by a number of West Midlands bodies. This has resulted in SHAP being invited to present and to be part of working groups that are currently defining new standards for healthy new homes. Invitations to SHAP to provide research information and briefings have come from organisations including:

- WM Health and Planning Group
- Black Country Consortium Place Making & Land Theme Advisory Board and Garden City working group
- WMCA Energy Capital
- WMCA Environment Board
- WMC Housing and Land Board
- Birmingham City Council
- whg
- Pioneer Group
- Accord Housing
- Walsall Council

Specifically the research has supported input to:

- the Langley SPD for a 6000 home urban extension in Sutton Coldfield and to the Commonwealth Games Athlete’s Village planning consultation process
- the Birmingham City Council Health Impact Assessment toolkit which one of the Validation Requirements for Planning Applications, 2018.
- the WM Health and Planning Group discussions on healthy homes
- the WMCA Environment Board discussions on creating healthy, low carbon places
- the WMCA healthy homes standard and new build Design Charter
- the WMCA working group on offsite construction of new homes (AMCAP)
- presentation to the Black Country Consortium land delivery board and Garden City working group
- two ERDF applications for innovative low carbon housing in GBSLEP
11.0 NEXT STEPS: SHAP ACTIVITY – 2019 AND BEYOND

The emerging West Midlands Combined Authority (WMCA) agenda is developing fast and will see the finalisation of the WMCA Industrial Strategy in the very near future. The WMCA, its constituent members and the West Midlands LEPS and wider local authorities are all striving to deliver against issues of new build numbers, fuel poverty, the condition of housing in the owner occupier and private rented sectors. SHAP is continuing to engage with stakeholders from the private and public sector to update the research and support informed decisionmaking.

In 2019, SHAP will continue to:

➢ Raise awareness of the potential benefits of new approaches to specification, procurement and financing of housing projects with policy makers, developers, stock managers and planning authorities.
➢ Develop the evidence base supporting a ‘total cost of occupation approach’ in determining the financial model and business case for housing projects.
➢ Support development of regional funding pots for investment in high quality, affordable, healthy new build and existing homes working with key stakeholders including financial institutions and the WMCA.
➢ Work with Local Authorities, social housing providers, the private sector and key stakeholders in development of projects focussed on long term outcomes from investment in housing projects.

SHAP Members and their strategic partners are invited to attend the next SHAP conferences on new build housing and fuel poverty

- New Housing Development - Planning, Procurement and Viability – 11 April and 22 May 2019
- New approaches to addressing Fuel Poverty in the West Midlands – June/July 2019

The SHAP workshop and conference programme is free for Members (including WM Local Authorities and social housing organisations) and can be found at www.shap.uk.com/events.

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26 The SHAP workshop and conference programme is free for Members (including WM Local Authorities and social housing organisations) and can be found at www.shap.uk.com/events.
The table below summarises how each of the three research workstreams is being used and the proposed continued activity.

**Figure 5 - How the SHAP research is being used**

<table>
<thead>
<tr>
<th>Research Workstream</th>
<th>Activity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retrofit finance and success factors in retrofit projects</strong></td>
<td>1. Meet WMCA Environment and Housing and Land officers to discuss appointment of SHAP to input to development of healthy homes standards which will form part of the WMCA Design Charter and single commissioning framework supporting the delivery of 215,000 new homes to be launched in April 2019.</td>
<td>X X</td>
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<tr>
<td></td>
<td>2. Continue planning for a WM fuel poverty programme funded by ECO 3 to trial principles of ECO 4 and continue development of projects and programmes with match funding identified using the Retrofit Finance Model research to include all tenures – decision expected April 2019. Pilot proposals being developed with Marches Energy Agency for Herefordshire, Shropshire and South Staffordshire. Also with Dudley, Coventry, Walsall, Birmingham, Worcestershire Authorities, Sandwell and Solihull.</td>
<td>X X</td>
</tr>
<tr>
<td><strong>Smart and sustainable procurement</strong></td>
<td>3. Continue to work with SMS on the Surefire Procurement Framework case study, awareness raising and continuous improvement</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>4. Continue planning a high level conference on Planning, Viability and Performance Standards to for planning officers, new build developers (all sectors) and WM LEPs and local authorities and their strategic partners to map progress towards a Total Cost of Occupation financial appraisal for new build housing – January – June 2019</td>
<td>X X</td>
</tr>
<tr>
<td><strong>New build healthy homes performance standard</strong></td>
<td>5. Continue to work with whg, Accord Group and Birmingham City Council and others on procurements testing the SHAP Smart and Sustainable Procurement model and new build healthy homes performance standard</td>
<td>X X</td>
</tr>
<tr>
<td></td>
<td>6. Continue to work with WM LEPs to support development of ERDF bids for innovative low carbon housing (new build and retrofit), incorporating all the SHAP 2017/2018 research findings and models</td>
<td>X X X</td>
</tr>
<tr>
<td></td>
<td>7. Continue to engage with Black Country Consortium on incorporation of SHAP 2017/2018 research into strategic plans and detailed delivery of new build housing and on area based regeneration projects</td>
<td>X X X</td>
</tr>
<tr>
<td></td>
<td>8. Continue to provide dissemination and workshop programme in 2019 for WM housing sector representatives and draw on wider UK experience and good practice</td>
<td>X X X</td>
</tr>
<tr>
<td></td>
<td>9. Update SHAP 2017/2018 research models and findings as new information comes forward and supply chain case studies are developed</td>
<td>X X X</td>
</tr>
<tr>
<td></td>
<td>10. Work with WM business support programmes offering support to low carbon innovation supply chains supplying goods and services to the housing sector such as BECCI, ARLI</td>
<td>X X X</td>
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<tr>
<td></td>
<td>11. Continue Energiesprong UK case study update as the rollout continues</td>
<td>X X X</td>
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<tr>
<td></td>
<td>12. Begin planning a project examining the links between infrastructure investment and decisions on site wide planning including housing design, construction and associated resource management (land, energy and water)</td>
<td>X</td>
</tr>
</tbody>
</table>
SECTION B: RESEARCH REPORTS SUMMARIES

12.0 INTRODUCTION

Despite the UK spending £40bn a year on housing, there is no guarantee of the cost, quality, timescales or long term outcomes from housing projects.

The SHAP 2018 research was undertaken to determine approaches that would:

1. Address system failures to achieve high quality, predictable and controllable outcomes from housing investment
2. Address a range of UK priorities for action and specific issues affecting new build and existing housing
3. Be able to be implemented now to drive systemic change in decisionmaking and investment in the housing sector

12.1 Research Questions

The SHAP working groups identified three linked and interdependent aspects of housing investment, which were further refined to focus the 2018 research and five research questions.

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>FOCUSED RESEARCH AREAS</th>
<th>RESEARCH QUESTIONS</th>
</tr>
</thead>
</table>
| Housing Standards    | Standards for new build                                | 1. What are the relevant standards for a high quality, healthy, energy efficient home fit for 2050?  
                        |                                                        | 2. How much will a 2050 home cost?                                                   |
| Procurement          | Procurement models for more predictable delivery of desired outcomes | 3. How can value for money and long term outcomes from investment in housing be assured?  |
| Finance              | Finance for retrofit                                   | 4. What are the finance options supporting investment in the UK housing stock to address fuel poverty, carbon emissions reductions and energy efficiency targets?  
                        |                                                        | 5. What are the success factors behind good project outcomes?                     |
12.2 Research Criteria

Each group was required to address the following:

1. The research should encompass ALL HOUSING TENURES and be relevant to:
   a. Many types of housing construction
   b. Urban, rural and suburban areas
   c. Whole place solutions
   d. Changing energy system, demographics, health and wellbeing contexts
   e. Existing planning regulation but set a vision and plan for future planning policy and Building Regulation reviews
   f. Local housing priorities and policy drivers
   g. Building resilience to increasing extreme weather events and changing energy demands

2. The final research outcomes should be easily accessible and might include flowcharts/checklists and process maps to help decisionmakers identify the most relevant roadmaps, milestones and drivers for their particular circumstances.

3. There should be a mechanism for the research findings and recommendations to be updated over time.

4. The research should build on existing information wherever possible and NOT reinvent the wheel or duplicate other work currently or recently launched.

5. The research should recognise that any voluntary standards and processes proposed could be aspirational but should be underpinned by a pragmatism of how decisionmakers can move forward to secure better outcomes from housing investment.

SHAP has had the benefit on being able to draw on its own previous research, which provided a strong base from which to start the 2017/18 research.27

27 www.shap.uk.com/resources
12.3 Research Outputs

Five reports were produced.

1. New build healthy homes performance standard
2. Costs for enhancing new build homes energy performance
3. Smart and sustainable procurement model
4. Success factors in planning and delivering retrofit projects
5. Finance models for retrofit

A short summary of each report output follows.

The research background, invitation to participate and full reports can be seen at www.shap.uk.com/research.

The detailed research reports are available at:

- West Midlands new build healthy housing performance standard matrix
- SHAP standard presentation – conference – handout
- West Midlands new build healthy housing performance standard supporting notes
- Costing Energy Performance Enhancements Beyond Building Regulations
- Smart and Sustainable Procurement Model July 2018
- Maximising Outcomes from Investment in Domestic Retrofit
- Finance Models for Retrofit of All Housing Tenures
<table>
<thead>
<tr>
<th>RESEARCH REPORT 1</th>
<th>SHAP NEW BUILD 2050 HEALTHY HOMES PERFORMANCE STANDARD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RESEARCH QUESTION</strong></td>
<td>What are the relevant standards for a high quality, healthy, energy efficient home fit for 2050?</td>
</tr>
<tr>
<td><strong>TERMS OF REFERENCE</strong></td>
<td>Following the Housing Standards Review in 2015, there has been lack of clarity and consistency about how previous guidance should be applied to new build housing design. The current position is that the UK risks building a generation of houses that will have to be retrofitted in the future as it rushes to meet the demand for new housing. However, industrialisation of construction means that standards significantly better than current Building Regulations can be built now at an affordable price. Taking this into account, SHAP set out to produce a quantifiable standard for housing that is healthy to live in, future proof and fit for purpose in the face of societal, environmental and economic changes.</td>
</tr>
<tr>
<td><strong>OUTPUTS</strong></td>
<td><strong>UPDATABLE EXCEL BASED MATRIX GIVING TARGETS OVER TIME FOR 6 KEY TOPICS</strong></td>
</tr>
<tr>
<td></td>
<td>West Midlands new build healthy housing performance standard matrix</td>
</tr>
<tr>
<td></td>
<td>The standard has been developed as a matrix, setting out targets for 6 agreed topics with the potential to add sub topics (each with their own targets). Columns outlining current minima, proposed initial targets and future stretch targets (Current minimum &gt; SHAP 2020 &gt; SHAP 2025)</td>
</tr>
<tr>
<td></td>
<td>The matrix has been designed to be an open spreadsheet for ongoing updating with information contributed by stakeholders from the housing sector.</td>
</tr>
<tr>
<td></td>
<td>The matrix has 4 columns:</td>
</tr>
<tr>
<td></td>
<td><strong>Column 1</strong> = Six topics that have been identified as the key aspects of healthy, high quality, comfortable homes:</td>
</tr>
<tr>
<td></td>
<td>Space – internal</td>
</tr>
<tr>
<td></td>
<td>Place – external</td>
</tr>
<tr>
<td></td>
<td>Comfort – air quality, noise, temperature, ventilation</td>
</tr>
<tr>
<td></td>
<td>Energy – how energy efficient the house should be</td>
</tr>
</tbody>
</table>
Carbon – how the house contributes to the UK 2050 carbon targets and the decarbonisation of the housing stock

Water – how water efficient the house is

**Column 2** = currently regulatory minimum standards

**Column 3** = values above regulatory minimum standards which are either already been delivered today or are easily and cost effectively achievable by industry and are essential standards that should be met for housing to be delivered by 2020 to begin to make the UK housing stock fit for the foreseeable social, environmental and economic conditions in 2050.

**Column 4** = the standards that we must be building to if we are to deliver new build housing fit for the 25 years after construction and with the flexibility to be adapted to changing environmental, social/demographic and economic changes occurring by 2050.

It should be noted that it is permitted for Local Authorities to require energy performance up to the former Code for Sustainable Homes level 4 at this time.
ILLUSTRATIVE DIAGRAMMES CLARIFYING TARGETS, ASPIRATIONS AND PERFORMANCE


The matrix can be produced as a spider diagramme which can illustrate:

1. Pathways for chosen topics from current regulatory minimum standards to a 2050 homes standard
2. Local priorities and enhanced standards for particular topics
3. Actual performance of any home or development against current regulatory minimum standards and any locally specified enhanced targets.

A LIST OF EMERGING ISSUES FOR HOUSING DESIGN

West Midlands new build healthy housing performance standard supporting notes

These include the demand for live work lifestyles, increase in the use of digital communications and artificial intelligence, need to accommodate receipt of internet shopping deliveries.

KEY FINDINGS

The working group consultations confirmed that the overarching issue that should be addressed in a new housing standard should be HEALTH AND WELLBEING and should address both housing quality and internal environment but also external environment and placemaking. SHAP research shows that currently new homes are being built to different
standards, some still designed to meet the former Code for Sustainable Homes level 4 for example, and are performing to widely different standards, at times failing to meet basic Building Regulations and construction quality standards.

<table>
<thead>
<tr>
<th>RECOMMENDATIONS</th>
<th>Housing should be healthy, energy efficient and high quality.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All new housing should be designed to meet 2050 homes standards: i.e.</td>
</tr>
<tr>
<td></td>
<td>• will withstand extreme weather events (heat, cold, wind and flooding)</td>
</tr>
<tr>
<td></td>
<td>• can provide comfortable, healthy accommodation for a changing population (ageing, different household sizes)</td>
</tr>
<tr>
<td></td>
<td>• is easy to maintain and affordable to live in</td>
</tr>
<tr>
<td></td>
<td>• can be adapted as new technologies and systems are developed</td>
</tr>
<tr>
<td></td>
<td>Where all targets cannot be met currently, the housing design should plan for later adaptation and retrofit.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEVELOPMENTS SINCE THE RESEARCH REPORT WAS PUBLISHED</th>
<th>The Black Country Garden City has developed a set of principles for new housing developments and schemes are being accredited against these principles.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The West Midlands Combined Authority is developing a Design Charter which will be used as part of its Single Commissioning Framework for new housing developments. This already includes alignment with the Homes England requirement for all new developments to be assessed for placemaking quality against Building For Life 12.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NEXT STEPS</th>
<th>THE SHAP NEW BUILD HEALTHY HOMES PERFORMANCE STANDARDS MATRIX - Next Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Update current regulatory minimum standards as they change</td>
</tr>
<tr>
<td>2.</td>
<td>Update recommendations for quick wins where standards can be enhanced without excessive cost or complexity</td>
</tr>
<tr>
<td>3.</td>
<td>Update targets for a 2050 homes standard which will be resilient to extreme weather events, carbon emissions reductions targets, changing demographics and energy/communications systems</td>
</tr>
<tr>
<td></td>
<td>Creation of working groups or topic champions for research into progression of standards for each topic and subtopic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THE SHAP NEW BUILD HEALTHY HOMES PERFORMANCE STANDARDS TARGETS DIAGRAMME - Next Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Keep the graphic updated as policy and targets change. Add sub topics where appropriate.</td>
</tr>
<tr>
<td>2. Investors, developers and local authorities:</td>
</tr>
<tr>
<td>• illustrate their existing standards using the diagramme.</td>
</tr>
</tbody>
</table>
• develop a ‘roadmap’ to move to delivery of the SHAP 2025 standard and deliver homes fit for 2050.

4. Map the extent of compliance with Building Regulations and other standards. Where a ‘performance gap’ is identified, require remedial action to be taken. Recognise good and excellent compliance with standards required for development with awards, accreditation schemes etc.

PERFORMANCE STANDARDS LOCAL PRIORITIES/TARGETS DIAGRAMME - Next Steps

Investors, developers, policy makers and regulatory bodies:
• illustrate their existing standards using the diagramme.
• develop a ‘roadmap’ to move to delivery of the SHAP 2025 standard and deliver homes fit for 2050.

BUILDING PERFORMANCE EVALUATION TOOL - Next Steps

Map the extent of compliance with Building Regulations and other standards. Where a ‘performance gap’ is identified, require remedial action to be taken. Recognise good and excellent compliance with standards required for development with awards, accreditation schemes etc.
### RESEARCH REPORT 2

<table>
<thead>
<tr>
<th>INITIAL COSTS FOR THE ENERGY ASPECTS OF SHAP’S HEALTHY HOUSING NEW BUILD STANDARD</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>RESEARCH QUESTION</th>
<th>What are the costs for homes designed to the SHAP new build healthy homes energy performance standard?</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINK TO FULL REPORT</td>
<td>Costing Energy Performance Enhancements Beyond Building Regulations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TERMS OF REFERENCE</th>
<th>The Sustainable Homes Action Partnership appointed CAR to examine the additional costs involved in going beyond the minimum performance requirements of current Building Regulations for energy conservation. We explored the costs of energy-related materials and components in homes designed simply to meet the Building Regulations, and then we explored the costs of three levels of performance going beyond the mandatory requirements:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Level 1 – comprehensive fabric improvements and a mechanical ventilation system with heat recovery (MVHR), with no renewable energy.</td>
</tr>
<tr>
<td></td>
<td>• Level 2 – comprehensive improvements to fabric and ventilation plus renewable energy in the form of an air-source heat pump and a photovoltaic array.</td>
</tr>
<tr>
<td></td>
<td>• Level 3 – comprehensive improvements to fabric and ventilation plus renewable energy in the form of an air-source heat pump and a large photovoltaic array.</td>
</tr>
<tr>
<td></td>
<td>SHAP asked CAR to consider the extra costs of exceeding Building Regulations for both traditional masonry (brick and block) homes and modern methods of construction using timber frame and/or timber panel construction.</td>
</tr>
<tr>
<td></td>
<td>Our brief was to go as far as possible using proven materials and systems, with the intention of achieving near-zero carbon if we believe this to be possible.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUTPUTS</th>
<th>We assumed a total floor area of 84m², based on the national space standard minimum size for a three-bedroom, four-person, two-storey dwelling. However the energy modelling and costing results are also presented on a per square metre basis, so they could be adjusted for use on larger or smaller houses.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The energy modelling was undertaken using SAP 2012. First we modelled a Building Regulations Part L1A 2013 compliant home, with specification assumptions based on the NHBC Foundation’s Part L 2013 – where to start guides for masonry and timber construction in England (NF58 and NF59), with some adjustments to achieve compliance for the particular house type modelled. A summary of the base case specifications is shown below.</td>
</tr>
</tbody>
</table>
This was repeated for 3 levels of enhanced energy performance.

**Costs**

We used the 2018 edition of Spons, the Architects’ and Builders’ Price Book, which has unit costs for all building materials and components, and labour rates, along with adjustment factors for the West Midlands, to estimate new build costs for a three-bedroom house of 84m². We calculated this cost for both timber frame and masonry construction, although we found that the difference in cost was modest. This supports other research suggesting that the primary benefit of modern methods of construction is not construction cost, but speed of construction and time on site.

Then we used the Architects’ and Builders’ Price Book to generate high-central-low estimates for the fabric and energy systems upgrades outlined above, for both timber frame and masonry buildings.

We supplemented the Spons pricing data by carrying out Internet searching of building components that were not listed in Spons, searching for both component and installation costs.

**Findings – Energy and Carbon**

The modelling showed that on for individual measures, the most significant gas savings (aside from switching to an air source heat pump) came from MVHR in combination with improved air-tightness, although electricity use increased due to running the MVHR (mechanical ventilation and heat recovery) system. Of the insulation measures alone, switching to triple glazing showed the highest savings, followed by increased wall insulation. However, adding flue gas heat recovery, based on the assumptions of this particular modelling project, showed greater gas savings than all of these insulation measures. (Readers should note that this may be an artefact of SAP 2012, and the true savings from flue gas heat recovery may be lower – probably only 1 to 5% of annual gas use, and there is no reliable field data to support even this.)
These savings are very significant – especially in view of the relatively good starting point. Our Base Case new home has modelled carbon emissions of 1.5 tonnes CO2 a year – dramatically better than the carbon emissions of average UK homes, which were 5 tonnes a year just four years ago. The Level 2 savings with a PV array and excellent air-tightness bring down annual carbon emissions to almost zero (modelled emissions of 96kgCO2/y). Level 3, meanwhile, reduces carbon emissions to ‘negative’ 850kgCO2/y – meaning it displaces the carbon emissions of another house’s use of electricity in the summer, which would otherwise emit 850kgCO2.

**Findings – Construction costs**

Total construction costs for new homes can vary widely, as evidenced by SHAP’s survey of housebuilders that suggested typical above-ground costs for a three-bed semi-detached home of 84m2 can be as little as £50,000 or as much as £180,000. The site, structure and choice of materials and systems can bring major variations. This range in construction costs applies equally to masonry/traditional and to timber frame/modern methods of construction.

In this study we are not interested in the relative cost of timber frame compared to masonry construction, but we are concerned about the extra-over cost of achieving higher energy and carbon performance. We have set out a bottom-up cost model of all of the improvements needed to ‘conventional’ new house-building, working out the difference in materials and labour costs between simply meeting the Building Regulations and going far beyond the Regulations in terms of energy efficiency. Our overall findings are summarized in the tables below, with much more detail provided in the Costs Spreadsheet. One table sets out costs for traditional construction. A second table sets out costs for modern methods of construction.
Cost reduction potential

For all three improvement levels, there could be major savings with offsite construction and/or a more industrialized approach to house-building. In the Netherlands, Factory Zero has achieved major cost reductions by optimizing each process and integrating components in building energy modules for Energiesprong homes, and indeed for the total cost of energy efficiency improvements. The cost of their energy module (incorporating MVHR, a heat pump, a hot water tank, inverters for PV, controls and monitoring equipment) has fallen from £25,000 to only £11,000. Similar cost reductions may be possible for new homes, if they can be delivered at sufficient scale to permit construction firms to integrate and optimize processes.

Energiesprong aims to create a net-zero energy home with a lifetime cost that is no more than a Building Regulations compliant home of today. 8,000 Energiesprong homes are in planning for delivery in 2018 in the Netherlands, and 4,000 of these are new build. The initial Energiesprong model aims to create a market in the UK social housing sector, with higher upfront costs neutralised by an additional charge to tenants, made possible thanks to guaranteed lower energy bills.

Similarly, large sites – say more than 30 units – will also benefit from economies of scale, even if they use traditional methods of construction. Labour costs, especially, are likely to fall. Data provided by housebuilders in the West Midlands suggested that the savings in above-ground costs are around 20%.

It is important to recognize that it is significantly more economical to build beyond Building Regulations now rather than having to retrofit today’s homes in 2030 or 2050 to achieve higher levels of performance. Adding retrofit insulation measures, or trying to improve airtightness, or adding MVHR or a heat pump with large emitters would all cost significantly more after a home has been completed. Even excluding the disruption and cost of carrying out work around residents, carrying out most energy efficiency
work on an existing home is more complicated and more expensive than getting it right from the start.

All three improvement Levels presented here could potentially unlock additional funding for local authorities and housing associations – for example, from guaranteeing low energy bills for tenants, by saving money on maintenance costs (especially annual Gas Safe checks for Levels 2 and 3), and from selling electricity back into the grid.

**KEY FINDINGS**

It is difficult to get actual data on build performance and costs. Workshop attendees commented that some of the costs derived from industry standards (SPONS) are behind actual costs on site and for some of the modelled costings are less than those included.

Other reports also confirm that some costs can be expected to fall as scale of adoption of higher energy performance targets grows.

These points should be taken into account when reading the report and repeating the figures below. Further research is recommended to increase the data on costs and performance.

Our modelling using SAP 2012 suggested that it is possible to achieve a 30% saving in average gas use by improving the building fabric and using MVHR. There is a penalty in electricity use, which increases a little to drive the MVHR system, but there are likely to be accompanying improvements in air quality and comfort.

For small-scale developments of fewer than 10 homes this Level 1 scenario would add £6,800 to £7,100 to the cost of building a three-bedroom semi-detached home at present costs – roughly a 10% premium on above-ground construction costs. For larger scale projects of 30 or more units, the cost would fall further because of economies of scale – probably in the region of £5,600 per unit.

The cost range covers the extra-over costs for both masonry and timber frame. Removing the MVHR system would reduce this cost by around £3,800 (less for large developments), but this would bring an energy penalty because the heat in stale air leaving the home would not be recovered. Taking out the MVHR would also bring an air quality penalty because incoming air is unfiltered, and ventilation in rooms apart from the kitchen and bathrooms would be largely dependent on wind speed.

Our modelling also suggested that it is possible to reduce gas use to zero by carrying out the same fabric and ventilation system improvements, and at the same time incorporating an air-source heat pump and photovoltaics (PV). In this Level 2 scenario a 2.5 kWp PV array generates almost enough electricity over the course of the year to repay all of the electricity used for heating, ventilation and lighting (but not appliances) for the home. It brings annual carbon emissions to near-zero, and achieves an EPC ‘A’ rating.
For small-scale developments this scenario would cost £14,300 to £14,400 more than a three bedroom semi built to the minimum requirements of the Building Regulations – roughly 20% more, for either masonry or timber frame. (Again, the costs would be lower for larger schemes – in the region of £11,500.) As for Level 1, £3,800 would be saved by removing the MVHR, but at the cost of higher energy use and poorer air quality.

A Level 3 scenario (as for Level 2 but with a large PV array) would cost £17,800 to £17,900 more than a home built to the minimum requirements of the Building Regulations, but it would generate significantly more than the energy used in the house. (Once again, the costs would fall on large sites – say £14,100 for more than 30 units.) This is roughly 23% more than usual costs. Electricity generated by the PV could be sold into the grid to generate an income stream for either tenants or the property owner. (The EPC rating is unchanged at A-rated.)

If the improved specification was applied at scale, with thousands of units a year built to these levels of performance, allowing industrialized manufacture and prefabrication, all of these costs could fall by around half.

Over a 30-year time horizon, modelling suggests Level 1 would save more than 8 tonnes of CO2 for each improved home, Level 2 would save more than 43 tonnes of CO2 per home, and Level 3 would save more than 72 tonnes of CO2 per home. These improvements sound modest, but given that the UK is poised to build 225,000 to 275,000 or more new homes a year, the aggregate savings potential is very considerable.

It is also significantly more economical to build to higher standards now than it would be to build to minimum standards now and retrofit in 2030 or 2050 to meet future standards of energy efficiency. Even excluding the disruption of carrying out work on occupied homes, it is simpler for almost all energy efficiency improvements (insulation, high spec windows, MVHR, air-tightness) to get it right from the outset rather than taking buildings apart and putting them together again later.

**RECOMMENDATIONS**

New build costs are difficult to establish. There is an expectation that industrialisation of housing construction, alongside traditional build, will result in improved quality, future cost reductions and new employment opportunities but this needs to be verified.

The CAR research investigated a particular fabric and technology solution to move from Building Regulations to zero carbon homes. Other solutions should be costed.

**UPDATES SINCE THE REPORT WAS PUBLISHED**

SHAP has been working with the West Midlands Health and Planning Group and the WMCA Advanced Manufacturing working group who are developing information for the WMCA Design Charter.
<table>
<thead>
<tr>
<th><strong>The SHAP standard has been incorporated into the Birmingham City Council Health Impact Assessment which forms part of the Birmingham Planning validation criteria.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The WMCA is working with Homes England and has also adopted Building for Life 12 as its placemaking standard.</strong></td>
</tr>
<tr>
<td><strong>SHAP is working with the Black Country Garden City on the update of its design principles.</strong></td>
</tr>
<tr>
<td><strong>Oxford City Council has worked with CAR to further develop the research to understand the investment envelope for retrofit based on the energy bills savings to tenants.</strong></td>
</tr>
<tr>
<td><strong>NEXT STEPS</strong></td>
</tr>
<tr>
<td>RESEARCH REPORT 3</td>
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<tr>
<td>-------------------</td>
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<tr>
<td>RESEARCH QUESTION</td>
</tr>
<tr>
<td>LINK TO FULL REPORT</td>
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<tr>
<td>TERMS OF REFERENCE</td>
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<tr>
<td>OUTPUTS</td>
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</tbody>
</table>
1. **THE RATIONALE FOR ADOPTION OF A SMART SUSTAINABLE PROCUREMENT PROCESS**

There are a range of benefits for WM local authorities and housing organisations from adopting smart and sustainable procurement processes.

- Faster delivery
- More durable product
- Improved value for money
- Reduce financial/operational risk
- Increase reputational recognition/Meet social objectives (CSR)

2. **THE PRINCIPLES OF SMART AND SUSTAINABLE PROCUREMENT**

The research report gives definitions of smart and sustainable procurement, value for money, whole life costing and the concept of faster, cheaper and better. These are all key principles of approaching investment in terms of long term outcomes rather than cost.

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**Smart & Sustainable Procurement**

*A purchasing system which enables organisations to meet their needs for goods, services, works and utilities in a way that is faster and cheaper; and achieves value for money on a whole life basis in terms of generating benefits not only to the organisation, but also to society and the economy, whilst minimising damage to the environment.*

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**Whole Life Costing**

*Whole life basis* means: considering the environmental, social and economic consequences of design; non-renewable material use; manufacture and production methods; logistics; service delivery; use; operation; maintenance; reuse; recycling options; disposal; and the suppliers' capabilities to address these consequences throughout the supply chain”.

**Value for Money (VFM)** means:

- the most advantageous combination of cost, quality and sustainability to meet customer requirements *(whether for infrastructure, product or service)* where:
  - cost means consideration of whole life cost
  - quality means a specification which is fit for purpose and sufficient or better to meet customer requirements over the life of the product or service.

**Faster and Cheaper (and Better)** means:

- understanding the existing market and market offer before purchasing
- introducing efficiency savings in project design rather than in value engineering thus:
  - shortening the purchasing process or contracting period and reducing administrative time
  - reducing or streamlining supply chains
  - reducing business risk by eliminating late orders, over runs and reworks
3. **THE PROCESS OF SMART AND SUSTAINABLE PROCUREMENT**

The process requires clear identification of the outcomes required from the procurement, an iterative process with a feedback loop ensuring continuous improvement, supported by investment in monitoring and evaluation.
4. **THE DRIVERS SUPPORTING AN OUTCOME BASED APPROACH TO PROCUREMENT**

There will be a range of objectives acting as drivers for outcome based approaches to procurement.

<table>
<thead>
<tr>
<th>Deliver value for money purchasing, create value for the organisation</th>
<th>Promote purchase of clean technologies and resource efficient products and services</th>
<th>Encouraging and introducing innovation to improve public infrastructure and services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintaining air and water quality</td>
<td>Investing in the local economy - Opening up supply chains and removing barriers to entry for SMEs, social enterprises, community organisations. Increasing employment opportunity</td>
<td>Enhancing social value Embedding fair employment practice Investment in community assets and improved services</td>
</tr>
<tr>
<td>Preserving and regenerating the natural environment and protected buildings and sites</td>
<td>Encouraging wider participation. Regular engagement/communication with stakeholders - brand reputation</td>
<td>Delivering Sustainable Development Goals</td>
</tr>
<tr>
<td>Developing effective value-added partnerships and collaborations with and between suppliers</td>
<td>Meeting legislation and corporate strategies - climate change targets, community engagement, health and safety, air quality</td>
<td></td>
</tr>
</tbody>
</table>
5. **THE ROLE OF THE ‘AWARE’ CLIENT**

At the heart of a smart and sustainable procurement process is a client who drives the process from a position of being aware of the procurement objectives and the potential for the procurement process to manage risk, add value and create a continuous improvement culture.

- THE AWARE CLIENT
- Appoints Board Room Champion
- Establishes User - Buyer- Supplier 'teams'
  (with delegated authority)
- Acquisition Planning
  Manages Demand (Do we need to buy?)
- Prioritises company spend
- Assesses (purchasing) risk
- Identifies business opportunity
- Introduces Early Market (Supplier) Engagement
- Prepares specification
  (with identified sustainable outputs/outcomes /KPIs)
- Awards Contract and Oversees Delivery
- Carries out Monitoring and Reporting
- Commissions external audit and Implements Recommendations/Improvements
- Continuous improvement - feedback loop
### KEY FINDINGS

The research found that there is considerable interest in smart and sustainable procurement among academics, policy makers, professional bodies and business organisations, and especially in its implementation across supply chains. Over the last few years the adoption of smart and sustainable procurement as a business tool has been supported by revised European legislation\(^{28}\). No new legislation is required in the UK before smart and sustainable procurement process can be adopted.

The benefits from adoption of a smart and sustainable procurement process at organisation level include clearer definition of the objectives of investment, better risk management and improved learning and feedback into future projects and strategic planning.

However the adoption of smart and sustainable procurement principles as a recognised business tool is inconsistent and in most organisations forms only a small part of the established procurement process. In discussion, practitioners revealed that there is often limited knowledge of best practice and insufficient evidence to gain organisational/corporate support for a process which, while offering longer term advantage, requires a commitment to adopting and following a robust process driven by strong leadership. The research also confirmed that there is evidence that the lack of a feedback loop results in little learning from investment in innovation projects being taken forward to inform future strategies and investment decisions, regardless of whether things seemed to have gone well or gone badly.

### RECOMMENDATIONS

1. Raise awareness with those involved in procurement processes of the benefits of adopting a smart and sustainable procurement approach
2. Carry out any training required
3. Confirm the critical role of the ‘aware’ client
4. Commit to a robust process including continuous learning with adequately resourced monitoring and feedback stages

### UPDATES SINCE THE RESEARCH REPORT WAS PUBLISHED

Most recently the Construction Leadership Council (CLC) has led work on Procuring for Value in the UK Construction sector deal\(^{29}\), which will inform the development of the Industrial Strategy. The aim of the CLC study is to connect procurement clearly to delivering overall business value though supporting improved productivity and efficiency in the sector.

Two case studies are being finalised that demonstrate the power of a smart and sustainable procurement process:

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\(^{28}\) EU Directive 2014/24/EU on Public Procurement

\(^{29}\) Ann Bentley. Global Director, Rider, Levett, Bucknall and Member of Construction Leadership Council, Procuring for Value and the UK Construction Sector Deal. 2018
1. Energiesprong programme in Nottingham. The first Energiesprong deep retrofit pilot has been analysed. A second pilot will be delivered taking into account lessons learnt. The learning from both pilots will then inform the rollout to a further 150 homes.

2. Warmworks procurement by the Scottish Government to deliver a national energy efficiency programme for owner occupiers.

<table>
<thead>
<tr>
<th>NEXT STEPS</th>
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<tbody>
<tr>
<td>A Smart and Sustainable Procurement Process will be one of the key principles of the West Midlands £150m three year Fuel Poverty Programme which will enter the feasibility stage by April 2019. Several organisations have committed to work with SHAP on examining the recommended process and incorporating it into forthcoming procurements. Case studies will be published once the procurement processes have been undertaken.</td>
</tr>
</tbody>
</table>
## Maximising Outcomes from Investment in Domestic Retrofit

### Research Question
What are the success factors behind good housing project outcomes?

### Link to Full Report
Maximising Outcomes from Investment in Domestic Retrofit

### Terms of Reference
The Sustainable Homes Action Partnership appointed Steven Harris to examine a recently completed innovation project that trialled a number of retrofit systems and technologies. The evaluation included interviews with occupants and supply chain companies and analysis of monitoring data. On the basis of this evaluation and of a literature review, Steven was asked to advise on a list of success factors and areas of risk that should be taken into account when making decisions about improving the energy efficiency of existing homes.

There have been very wide rates of successful outcomes and value for money reports from investment in energy efficiency retrofit either in terms of insulation or the installation of new technologies. The objective was to understand more about success factors in designing retrofit projects and the likelihood of the household making best use of any new technologies installed.

This research looked at an innovation project which had 2 elements:
1. Deep retrofit of 6 homes with a number of different products and technologies used
2. Installation of renewable energy generation, storage and energy sharing technologies.

Questions posed included:

- What works in terms of technologies, monitoring and creating a more comfortable home
- What has not worked and what the tenants did not like
- Did bills reduce – if not, are the tenants more comfortable?
- What works in practice (different technologies, different levels of occupant engagement, monitoring, levels of capital investment and consequential maintenance and call out costs)
- How does the household demographic affect the technology outcomes?

### Outputs
1. The research looked data from 6 properties where a number of different kinds of insulation and technologies had been installed. The homes were also visited and informal surveys were carried out on the tenant experience of their home before, during and after the retrofit work.
Conclusions were summarised about the technical elements of the retrofit:

**Technical - what was looked at and did it work**

- EWI, loft and air tightness – yes, does the heavy lifting...but beware of (very) bad detailing
- Triple Glazing – yes, but for full benefit you must have no trickle vents so must have...
- Heat exchange ventilation – YES...! (always, anyway, whatever!)
- Hybrid heat pump gas boilers – No, not a solution for small retrofitted properties (<£2k gas)
- Solar thermal ‘under wall heating’ – maybe, but needs further detailed monitoring
- Solar PV with Electric batteries – yes, but not economically viable yet, but great potential
- Solar PV with Heat batteries – interesting... (perhaps a DHW solution and funding source)
- Solar PV with harvest share – almost, could be standard with further technical development
- Energiesprong – yes, but can highlight existing problems

In the pilot Energiesprong for treatment of the walls in the house above, the survey found fundamental issues with the property. However, the impact of the project was that tenants previously had to put £40 on their meter every week. After the retrofit they only spent £20 on the meter every few weeks.

2. The research looked at the different amounts of energy use between 2 homes which had been chosen because they were similar in build and similar in household. The research found that it is impossible to predict how homes are used and the energy demand of a house due to differences in lifestyle choices.
In the study one family was spending 20p a day on energy and the matched pair was spending £5 a day. While this is extreme it underlines the challenge of designing a retrofit and modelling the financial model. After the retrofit, the first family is still spending about 20p a day but the average winter indoor temperature has risen from about 14 degrees centigrade to 16 degrees.

**KEY FINDINGS**

... *Only when technologies and retrofit measures are tried in the real world, with real people living their everyday unique lifestyles, (and with full monitoring) can we tell what works, and what ‘works’ really means* Some fundamental conclusions were drawn:

In the last 5 years it has become obvious that energy savings from homes due to retrofitting cannot be calculated from building physics, they have to be measured.

The problem with homes is that people live in them!

Various studies have shown that when a home is insulated, the occupiers may ‘stop getting dressed under the bed sheets’. This is comfort take up. Householders may not make fuel savings, but their homes are now warm whereas previously they were ‘under heated’ to different extents. Building physics cannot happily calculate this.

SO... to work out the real benefit of a retrofit measure you cannot just look at the fuel bills, you have to see how the comfort conditions have improved. Additionally, this particular monitoring exercise records how residents occupy their homes, which could
reveal whether they are just heating the areas they occupy, or the whole house.

The theory is that basic energy efficiency retrofit may be taken up wholly in comfort. It is only advanced retrofit that pushes into fuel bill saving as the home starts to need far less energy to be comfortable.

Additionally, as this report reveals, there are all sorts of other complicating factors that effect home energy performance, which cannot be explained by building physics or even the temperature people run their homes at. In summary,

1. The success of a project is dependent on the degree of oversight of the design, delivery, maintenance
2. Projects must be designed ‘with’ people and not ‘done to’ people
3. The most effective elements to install are those that need least commissioning and engagement during operation e.g. insulation, passive ventilation systems

Questions To Ask When Planning A Retrofit

➢ Design – think about the whole house, not just the technology.
➢ Contract – who’s in charge? Are lines of responsibility and communication clear?
➢ Measure – monitoring is essential for understanding: does ‘it’ really work? (and what is ‘it’)?
➢ Control – how do you make sure householders get the best from their home?
➢ Energy vs Gas – might making a house more energy efficient make it less gas efficient?

Technical Recommendations

1. Don’t forget the boring stuff
Retrofit for energy efficiency should become just be part of good building and maintenance practice. Retrofit outcome targets should be based on comprehensive quantitative and qualitative standards. There is no point in a retrofit that is inexpensive to heat in the first year if it leaks and falls apart in the second.

If you do nothing else, put in heat exchange ventilation.

3. Domestic hot (tap) water is the next problem
We need further research on whether gas combi boilers are really the best way to create domestic hot water. Some of our monitoring seems to be suggesting far more gas is being consumed than heat created.

4. Know what you are doing – you can’t manage what you don’t measure!

Any retrofit pilot using new technology must include metering and monitoring or the outcomes will be unknown. There must also be budget for the analysis of the data or at the very least, an automatic dashboard display of Home Heating Coefficient (MPG for homes).

**Procurement Recommendations**

1. Avoid the race to the bottom – Become “The Intelligent Client”

Specifications and employers’ requirements should be as well considered, tight and comprehensive as possible in order to level the tendering playing field between experienced contractors and those who are yet to make (the same) mistakes.

2. Someone must be in overall charge of design and specification (and it be their fault!)

The fundamental decisions about how to retrofit a property should be made by a professional retrofit coordinator who should be completely technology and industry independent. There must be someone responsible for making decisions about the overall ordinary building details, and for them not to avoid liability by liquidating their company.

3. Avoid industry led solutions

The industry will always define ‘good’ as ‘good for the industry’. A builder (design and build contractor) will always define ‘good’ as good (easy) to build. A product company will always define good in the context of selling more of their products. As a “Intelligent Client” – you decide what ‘good’ is

4. Don’t try to fund retrofits from individual bill saving - there might not be any!

Some homes before Retrofit had very low bills – they were also cold.
and damp
After Retrofit they still have very low bills – however they are now warm and healthy
Other homes before Retrofit had very high bills – they were warm and (not normally) damp
These homes now have considerably lower bills. To have the greatest benefit, Retrofit should be funded by averaging bill saving, not individualising it as The Green Deal did.

5. Look sideways. Look out for funding opportunities from other sectors.

Aggregating the energy demand/storage/supply capacity of a housing portfolio might prove very profitable in the future.

<table>
<thead>
<tr>
<th>UPDATES SINCE THE REPORT WAS PUBLISHED</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAP is working with WMCA Energy Capital and £250,000 has been secured to fund the development of a West Midlands 3 year, £150m fuel poverty programme with a people centred approach at its heart. The findings and recommendations of this report will feed directly into the feasibility stage of the WM Fuel Poverty programme.</td>
</tr>
<tr>
<td>The recommendations of the Each Homes Counts report are being acted on and new accreditation standards (PAS 2035) are being developed which address a number of the recommendations of this report and will be nationally implemented.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>NEXT STEPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Continue to work with WMCA Energy Capital and WM organisations to develop a radical fuel poverty proposal with households at the centre of energy efficiency project design.</td>
</tr>
<tr>
<td>2. Campaign for monitoring and reporting so that any adverse impacts are quickly identified and rectified and to evidence improvements in comfort following retrofit.</td>
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</tbody>
</table>
**RESEARCH REPORT 5**

**SHAP FINANCE MODEL FOR FINANCING THE REFURBISHMENT OF EXISTING HOMES**

**RESEARCH QUESTION**
What are the finance options supporting investment in the UK housing stock to address fuel poverty, carbon emissions reductions and energy efficiency targets?

**LINK TO FULL REPORT**
Finance Models for Retrofit of All Housing Tenures

**TERMS OF REFERENCE**
SHAP appointed Red Coop to advise on:
1. The sources of finance that are available to fund energy efficiency retrofit works for all housing tenures
2. The mechanisms for landlords to be incentivised to invest in their stock through developing cost recovery models.

**OUTPUTS**
Retrofit to anything beyond the most basic measures requires low cost, long term, “patient” capital. The report examines current funding sources and identifies the most beneficial.

1. A large scale model to show how the components of retrofit could be assembled to work at regional scale.
2. An example of the opportunities to utilise different funding sources to create a viable finance model for deep retrofit.
3. Detailed tables mapping different funding sources relevant to different stockholders across all tenures.

The report includes several models and information tables.

1. Financial model of all the elements of a deep retrofit – this snapshot shows insulation proposals.

<table>
<thead>
<tr>
<th>RETROFIT MEASURES LIST</th>
<th>(£-value: unit, quantity, rate)</th>
<th>base cost (exc. VAT)</th>
<th>inc. VAT</th>
<th>quantity</th>
<th>total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOFT – loft insulation increased to 150mm thick, recycled timber and blown polyurethane</td>
<td>0.1 M2/UK</td>
<td>£11.95 / m2</td>
<td>£13.14</td>
<td>1</td>
<td>£13.14</td>
</tr>
<tr>
<td>LOFT TWC – loft insulation increased to 150mm thick, recycled timber and blown polyurethane</td>
<td>0.6 M2/UK</td>
<td>£17.86 / m2</td>
<td>£19.64</td>
<td>1</td>
<td>£19.64</td>
</tr>
<tr>
<td>LOFT additional ventilators</td>
<td>0</td>
<td>£96.00 / unit</td>
<td>£96.00</td>
<td>2</td>
<td>£192.00</td>
</tr>
<tr>
<td>PURCHASED ROOF INSULATION part 16 walls</td>
<td>0.2 M2/UK</td>
<td>£21.09 / m2</td>
<td>£25.30</td>
<td>1</td>
<td>£25.30</td>
</tr>
<tr>
<td>INSULATION TO CLAYS at external wall insulation</td>
<td>0.01 M2/UK</td>
<td>£59.65 / m2</td>
<td>£85.40</td>
<td>1</td>
<td>£85.40</td>
</tr>
<tr>
<td>INSULATION TO CLAYS at external wall insulation – including associated new stainless steel gutter</td>
<td>0.01 M2/UK</td>
<td>£241.64 / m2</td>
<td>£241.64</td>
<td>1</td>
<td>£241.64</td>
</tr>
<tr>
<td>WALLS – thin walls to provide acceptable external wall insulation through solid wall insulation</td>
<td>0.2 M2/UK</td>
<td>£21.09 / m2</td>
<td>£5.79</td>
<td>1</td>
<td>£5.79</td>
</tr>
<tr>
<td>WALLS – cavity walls, service duct within external wall insulation</td>
<td>0</td>
<td>£85.40 / unit</td>
<td>£85.40</td>
<td>1</td>
<td>£85.40</td>
</tr>
<tr>
<td>WALLS – cavity walls, move FIT equipment in area – L 350 and R 290</td>
<td>0</td>
<td>£136.00 / unit</td>
<td>£136.00</td>
<td>1</td>
<td>£136.00</td>
</tr>
<tr>
<td>WALLS – cavity walls, move satellite in operation – in areas of 350 and R 290</td>
<td>0</td>
<td>£85.40 / unit</td>
<td>£85.40</td>
<td>1</td>
<td>£85.40</td>
</tr>
<tr>
<td>WALLS – cavity walls, move alarm in area of 350 and R 290</td>
<td>0</td>
<td>£85.40 / unit</td>
<td>£85.40</td>
<td>1</td>
<td>£85.40</td>
</tr>
</tbody>
</table>
2. A summary of the works costs and bill savings at each stage of the retrofit

<table>
<thead>
<tr>
<th></th>
<th>unretrofitted</th>
<th>basic works</th>
<th>EW, windows &amp; roofline</th>
<th>internal disruption</th>
<th>renewables</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost of work</td>
<td>£3,228</td>
<td>£18,355</td>
<td>£14,926</td>
<td>£10,049</td>
<td></td>
</tr>
<tr>
<td>electricity bill</td>
<td>£845</td>
<td>£531</td>
<td>£531</td>
<td>£531</td>
<td>£163</td>
</tr>
<tr>
<td>gas bill</td>
<td>£793</td>
<td>£528</td>
<td>£309</td>
<td>£185</td>
<td>£185</td>
</tr>
<tr>
<td>total energy cost</td>
<td>£1,458</td>
<td>£1,060</td>
<td>£840</td>
<td>£716</td>
<td>£348</td>
</tr>
<tr>
<td>bill saving</td>
<td>£378</td>
<td>£219</td>
<td>£124</td>
<td>£308</td>
<td></td>
</tr>
<tr>
<td>% of original bill saved</td>
<td>25%</td>
<td>15%</td>
<td>9%</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>SAP rating</td>
<td>56</td>
<td>66</td>
<td>77</td>
<td>83</td>
<td>100</td>
</tr>
<tr>
<td>EPC rating</td>
<td>D</td>
<td>D</td>
<td>C</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

3. A number of financial spreadsheets then show the gross and net costs for different packages of work (internal, external, installation of renewables) over time against given interest rates. These can be used to determine the pay back periods and any funding gaps.

4. A model of how costs are predicted to fall as the scale of activity grow.
5. The report investigates repayment models and the opportunities from revenue stacking in addition to the reduction in energy bills following retrofit.

6. The report then investigates finance sources and presents them in a table which is divided into three sections: loan/investment, cost reduction/recovery and subsidy/grant and against 5 cross cutting categories of how the finance can be accessed.

The tables are then RAG rated them on the basis of their applicability to owner occupiers, the private rented sector, registered providers and the public sector; with green being available now and appropriate to those tenures, orange meaning possibly applicable but requiring either further work or the intervention of an intermediary, red suggesting not currently appropriate. The tick boxes indicate whether these models are appropriate for small scale and start up, medium scale and large scale.
7. The report gives a number of case studies against each finance type.

### KEY FINDINGS

Bringing our buildings up to modern standards of insulation, air tightness and services is complex and expensive but it is not impossible and it will form a key part of meeting our obligations if we are to stop catastrophic climate change.

A detailed example sets out the costs of retrofitting a property, taking it from a UK average EPC rating of 56 (low D) to 100 (zero net carbon for heat, light and hot water). Retrofit to anything beyond the most basic measures requires low cost, long term, “patient” capital.

We have examined current funding sources and identified the most beneficial. In 2012 the eminent City economist Roger Bootle gave a lecture asking “what the great Victorian entrepreneurs would have done if they had been confronted by interest rates and bond yields as low as we have today”. His answer: “They would have rebuilt the world.” Interest rates for savers have remained low since this statement.

We use a large scale model to show how the components of retrofit could be assembled to work at regional scale. We propose creating opportunities for savers to access opportunities to invest in projects with social as well as financial returns, as well as giving organisations and individuals with buildings to retrofit access to funding at rates which make projects viable. Retrofit requires a cross sectoral approach to develop the market over a period of years and maximise the potential of the public and third sector to bring sufficient numbers of people together to build capacity.

This report provides the outcomes of extensive research into finance available for energy efficiency retrofit for all housing tenures. The conclusion is that:

1. Bringing our buildings up to modern standards of insulation, air
tightness and services is complex and expensive but it is not impossible.
2. Finance is available but is only one of several necessary conditions for large scale retrofit to become ‘business as usual’
3. Blended finance models are being tested
4. Retrofit programmes should start small and learn before scaling up to avoid the risk of repeating mistakes of previous incentivised retrofit programmes

The research:
1. Shows how creating opportunities for savers to access opportunities to invest in projects with social as well as financial return can also give organisations and individuals with buildings to retrofit access to funding at rates which make projects viable.
2. Confirms that retrofit requires a cross sectoral approach to develop the market over a period of years and maximise the potential of the public and third sector to bring sufficient numbers of people together to build capacity.
3. Suggests that some owner occupiers and some private landlords are demonstrating leadership in retrofit that can help build the scale needed to establish process and costs for a national retrofit programme.
4. Foresees that as the energy system transforms and landlords see opportunities for offering a total cost of occupation to tenants there is likely to be a growing understanding of the benefits of high EPC ratings and inclusion of energy costs in rent.

Conclusions:
Finance is just one part of making the UK housing stock fit for the future and other issues need to be addressed as part of a national retrofit programme.

1 cheap patient capital
there is quite a lot of money around at rates we can work with, at the start some of this will need to be 10 year + bonds, the good news is they exist but to unlock that mean the covenant needs to be extremely good. so a key missing component for 99% of the industry is lack of...

2 trust in the outcome
to do this we need: more reliable calculation methods proper design not just in the construction details but in the overall look as well so that retrofit becomes aspirational workforce development - improvement of the skills we already have and rapid recruitment and training of many more performance guarantees

3 the costs of deep retrofit are currently much too high but it is reasonable to expect them to come down as the industry develops –
dependencies:
- supply chain development:
- contractor capacity building:
- interoperable software to bridge gaps and radically shift how contract management is done

RECOMMENDATIONS

Early retrofits are essential to establish trust in the retrofit process and establish best practice.

Finance is just part of making largescale retrofit happen.

Manage the need to scale up retrofit to achieve cost savings with the need to develop robust delivery processes and supply chain development

1. The research models are based on taking a typical city region of 1.2 million homes and retrofitting all of those to meet deep retrofit targets. These produce quite dramatic numbers to give an idea of the scale of endeavour were one to attempt such a programme, however the model is highly scalable.

As described earlier, retrofit costs will reduce over time as the market develops. However, to develop this retrofit market, there is a conflict between the need to do enough retrofits to generate the cost savings discussed and the fact that retrofit costs will not balance with savings and income until this has happened.

2. In addition, the need to develop a workforce means that the start will inevitably be slow. This creates a strategy that limits exposure to higher costs by not carrying out too large a number of loss making retrofits in the early years, with the market growing faster once the improvements to processes have been made.

Establish a finance vehicle to fund first pilots and finance largescale programmes

3. The early years retrofits will have a deficit - repayments for the costs of the work are higher than bill savings and income. This early years funding gap will need to covered somehow: our research suggests that this could be done by a combination of long term bonds (possibly backed by other established bodies), patient shares of some form, prudential borrowing or direct subsidy. The model suggests that there will be a high return in the future for those investors prepared to wait. Research into this vehicle needs to start while the pilots of the components of the overall model are being run, to enable an accelerated renewable energy and retrofit programme, allowing the region to capture the full economic, environmental and social benefits.
**Continue to develop understanding and capacity across a number of interdependent issues**

- Assessment and calculation
- Monitoring and data
- Specification and detailing
- IT and software
- Capacity
- Contracting and Guarantees
- Workforce development
- Renewable energy generation and storage
- Aggregation and peak demand shifting
- Financial Vehicles

**UPDATES SINCE THE REPORT WAS PUBLISHED**

1. Big changes to the way government-backed retrofit is carried out in the UK — including requirements to install ventilation, and to assess every retrofit measure after installation — are being proposed under PAS 2035, a new specification for the energy retrofit of domestic buildings.

   PAS 2035 has been developed as part of the ‘Each Home Counts’ process, which was established to tackle the high level of failure in domestic retrofit under government backed schemes, such as that at Preston.

   Among the provisions in the draft version of PAS 2035 are:

   - Designated roles: project designer, project manager, retrofit co-ordinator, retrofit assessor, with minimum qualifications and/or professional accreditations for each
   - The option to carry out performance modelling with PHPP, the passive house design and assessment software, as an alternative to SAP
   - A requirement to check ventilation in all retrofit properties, and to upgrade the system when it fails to meet set criteria
   - Compulsory post-installation assessment via occupant and client questionnaires.

   This will address a number of issues that have meant retrofit investment has often been wasted and, at worst, has increased problems of the housing in which it was installed.

2. SHAP is working with the WMCA Energy Capital on a 3 years, £150m ECO pilot across the West Midlands, to test new approaches to the delivery of fuel poverty programmes. The feasibility phase is expected to start in April 2019.

**NEXT STEPS**

Continue to develop process, governance and finance models for deep retrofit at area scale working with Energy Capital and other initiatives.
APPENDIX 1 - ACKNOWLEDGEMENTS

The findings presented in this report are based on the commitment and work of a large number of individuals and organisations who contributed to the various research strands. The authors of this report gratefully acknowledge the enthusiastic support of all those who collaborated in this work. The individuals and their roles can be found in APPENDIX 2. Thanks must also be given to the many people who took the time to attend and contribute to the workshops, which has contributed so much to shaping the findings of this work.

The work would not have been possible without financial support from West Midlands Housing Officers Group – Housing Research and Policy Programme together with match funding from Sustainable Housing Action Partnership (SHAP) and its members. Thanks are also extended to the European Regional Development Fund (ERDF) and EU Climate KIC Pioneers into Practice.

Events were hosted by Trowers and Hamlins LLP, by Anthony Collins LLP and the Energy Systems Catapult. There has been continuing support from the West Midlands Health and Planning Group who were instrumental in sharing ideas generated during this work with Public Health England (PHE) and local authority public health organisations.

Sustainable Housing Action Partnership

SHAP is working with the West Midlands Combined Authority (WMCA) on its delivery of the Local Industrial Strategy and with housing sector organisations across the West Midlands and wider UK. SHAP is named as the Green Buildings and Retrofit Lead on the WMCA Environment Board, reporting through Sustainability West Midlands, and also sits on the Health and Wellbeing working group and the Advanced Manufacturing working group reporting to the Housing and Land team. SHAP is liaising with the Natural Capital working group and with the Inclusive Growth Unit through Localise West Midlands. SHAP is working closely with Energy Capital on a proposal to trial new approaches to addressing fuel poverty.

The emerging WMCA Design Charter, as well as the update to the Birmingham City Council Developers Toolkit and the emerging West Midlands Fuel Poverty programme have been informed by the SHAP research described in this report. The research has formed the basis of events part funded by the European Regional Development Fund which led directly to the development of two ERDF applications for low carbon housing innovation projects.
APPENDIX 2 – RESEARCHERS AND RESEARCH GROUPS

The research was led by:

Steering Groups were chaired by:

- Finance Models for Retrofit: Alison Mathias, Alison Mathias Associates
- Smart and Sustainable Procurement: Pat Laughlin, EBC
- New Build Healthy Homes Performance Standard: revolving Chair: Emma Hickling, Rooftop Housing Group; John Bedford/Carl Taylor, Accord Group;

Research was carried out by:

- New Build Healthy Homes
  - Performance Standard: Rob Annable and Mike Menzies, Axis Design
  - Costings: Jason Palmer, Cambridge Architectural Research (CAR)
- Smart and Sustainable Procurement
  - Pat Laughlin, EBC
- Finance Models for Retrofit:
  - Finance Models: Charlie Baker and Sarah Hughes, Red Coop
  - Maximising Outcomes from Investment in Retrofit: Steven Harris, Steven Harris Ltd
Working groups were attended by representatives from:

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APPENDIX 3 - SHAP RESEARCH PROGRAMMES

SHAP was established as a resource for the housing sector in 2005. The objective was to provide evidence to decisionmakers to support policy and project design and delivery that would lead to a better national housing stock, supporting sustainable communities.

A good quality housing stock in the UK is seen as fundamental to addressing issues such as fuel poverty, isolation, homelessness, health, wellbeing and flourishing communities: investment in housing is an important contributor to local economies.

Since 2005, SHAP has looked at issues of new build housing, managing the existing housing stock and the potential for financing and delivering programmes of smaller housing projects. This research has included identifying success factors in delivering successful projects, energy performance standards for existing housing refurbishment programmes, the building blocks for area wide programmes and the potential economic impact of programmes of housing investment. The SHAP members set the research programme annually. All research is published at www.shap.uk.com.

The SHAP Research Process

SHAP is a cross housing sector not for profit membership network comprising leaders and innovators supporting development of a high quality sustainable housing stock in the UK. Each year the SHAP members identify emerging issues concerning areas of threat or opportunity that impact on the creation and support of a sustainable, affordable, healthy housing stock in the UK. These issues are taken forward as task and finish research projects. The findings are publicly disseminated.

Following the confirmation of research topics, SHAP members and their wider networks are invited to join working groups to further scope the research requirements. Steering groups are formed to support the technical input to the research. Existing information is requested and partners for action research are confirmed.

Once all available information is gathered, a brief is written to commission any consultancy services that need to be procured. The successful consultant engages with the steering group and working groups to complete the research.

Draft information is circulated to the wider SHAP network during the research and emerging findings are disseminated through workshops, conferences and presentations to interested stakeholders.

Draft and final research reports are uploaded to the SHAP website for public access and use.

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30 An initiative developed by Sustainability West Midlands