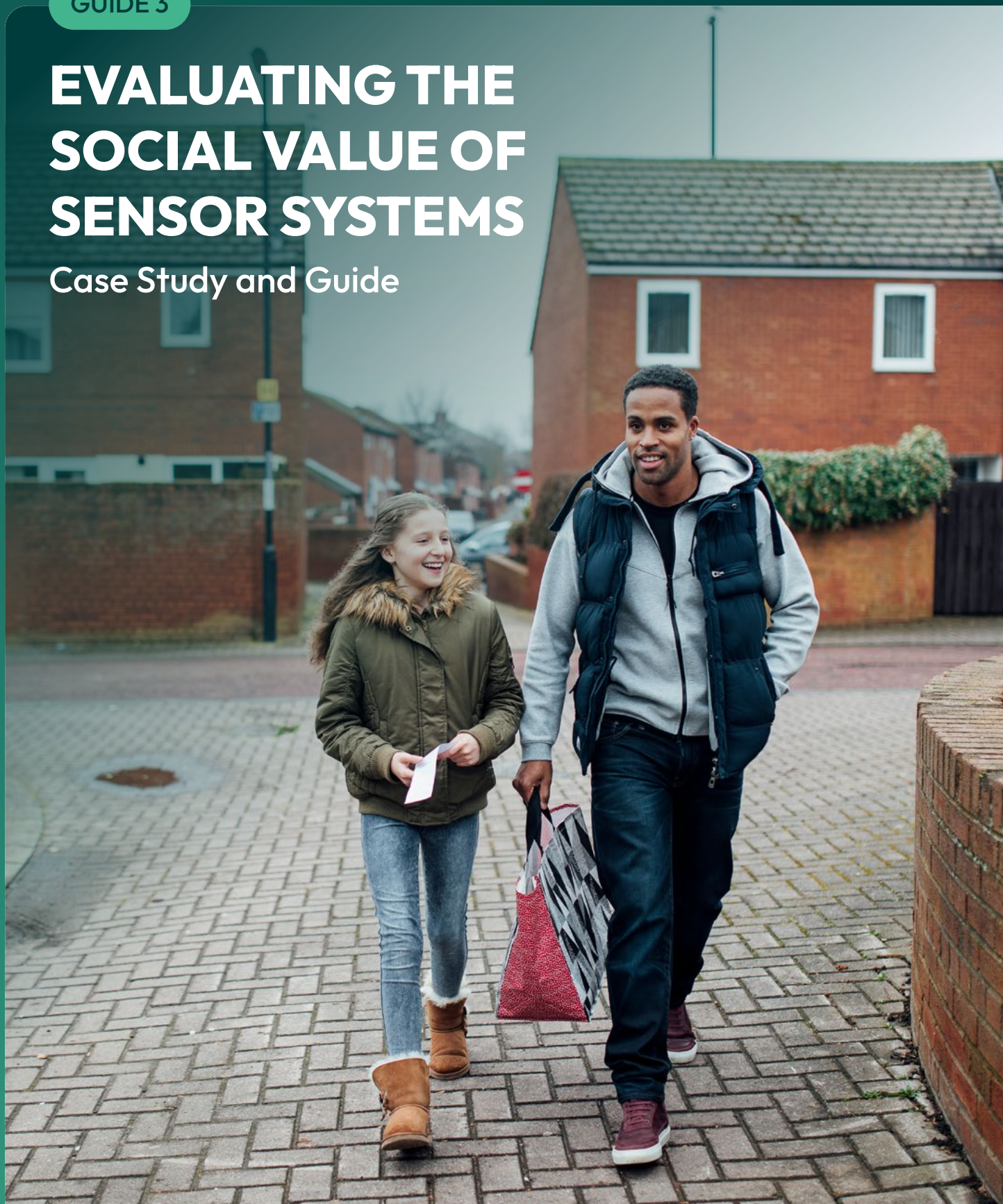
SENSOR SYSTEMS FOR HEALTHIER HOUSING: A SOCIAL VALUE GUIDE

University of Exeter

GUIDE 3

EVALUATING THE SOCIAL VALUE OF SENSOR SYSTEMS

Case Study and Guide



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About this guide

This guide takes you through the process of evaluating the social value of an indoor environment sensor system. We'll show how a sensor system has been used in practice by a housing association to improve residents' homes and health.

We've produced this guide for housing providers, in order to help planning, maintenance and procurement teams have an overview of the process, benefits and risks of investing in a sensor system.

The research informing this guide, along with referenced literature, is mostly drawn from the social housing sector. However, the insights are relevant to various other housing providers, (such as Housing Associations, Local Authorities and Arms Length Management Organisations).

The guide is the third guide in our series, which is made up from:

- Guide 1: **The Social Value of Home Sensor Systems: An Introductory Guide**
- Guide 2: **How Home Sensor Systems Generate Social Value: An Evidence-Based Guide**
- Guide 3 (this one): **Evaluating the Social Value of Sensor Systems: Case Study and Guide**
- A "Logic Model" that you can use to plan and evaluate a sensor system project

Evaluation: how do you measure the social value of a sensor system?

Social value is measured using a six-step process and seven principles, which were established by Social Value International. If you are intending to conduct an evaluation, we suggest you review the Principles and Methods guide available at the Social Value International website.

There are six key steps to conducting a social value evaluation.

1	**Establishing scope and identifying key stakeholders.**	It is important to have clear boundaries about what your evaluation will cover, who will be involved in the process and how.
2	**Develop a Logic Model.**	Through engaging with your stakeholders you will develop a Logic Model which shows the relationship between inputs, outputs and outcomes.
3	**Evidencing outcomes and giving them a value.**	This stage involves finding data to show whether outcomes have happened and then valuing them. Valuing refers to attaching a financial proxy to an outcome (proxies represent the importance of the outcome in monetary terms).
4	**Establishing impact.**	Having collected evidence on outcomes and monetised this, eliminate any changes that aren't a result of the intervention (they would have happened anyway or result from other factors).
5	**Calculating the social value & Social Return on Investment (SROI).**	This stage involves adding up all the benefits, subtracting any negatives and comparing the result to the investment. This is also where the sensitivity of the results can be tested.
6	**Reporting, using and embedding.**	Easily forgotten, this vital last step involves sharing findings with stakeholders and responding to them. This helps good outcomes become embedded.

Social value

Social value is the measurable wider benefit of an activity, action or project beyond the financial. In this case, it's the impact that monitoring home environments has on residents and communities, as well as wider services such as the NHS and public housing.

Social value provides a way to quantify how an intervention positively affects people's lives - the overall impact on people's wellbeing, or their quality of life. It's a method concerned with assessing whether an intervention is in society's interest.

See our previous guides for more detail on how and why sensor systems can generate social value.

Measuring social value is underpinned by seven principles. Like rules or guidelines, they ensure consistency and credibility.

The seven principles are:

1. Involve stakeholders.
2. Understand the nature of the changes, because a change can be intentional or unintentional, and positive or negative.
3. Value the outcomes that matter to your organisation and stakeholders.
4. Only include what is material and relevant to your organisation.
5. Do not overclaim beyond what you are responsible for.
6. Be transparent about the impact generated, even if it's negative.
7. Verify to ensure robustness and subjectivity in all social value reporting. Be responsive to insights, and make sure that decision making is timely and supported by appropriate reporting.

Case study introduction

The evaluation we present is from a study of a social housing association (HA) using an indoor environment sensor system to improve residents' homes and health, specifically Coastline Housing Association's (CHA) use of a sensor system. CHA is a not-for-profit HA that owns and manages around 6,000 homes with 12,500 residents across Cornwall, UK. The analysis presented in the guide is an output from Smartline, a six-year research and innovation collaboration between CHA and the University of Exeter (UoE).

Study location

The sensor project was conducted in an area of interlinked conurbations in central Cornwall; Camborne, Pool, Illogan and Redruth (commonly abbreviated to CPIR. See map below), where CHA has a high concentration of residents. The CPIR area includes some of the most deprived neighbourhoods in the UK, and has higher than national average incidences of mould, fuel poverty and long-term health issues. These are combined with a warm and wet maritime climate, which increases the risk of people living in poor indoor environments.

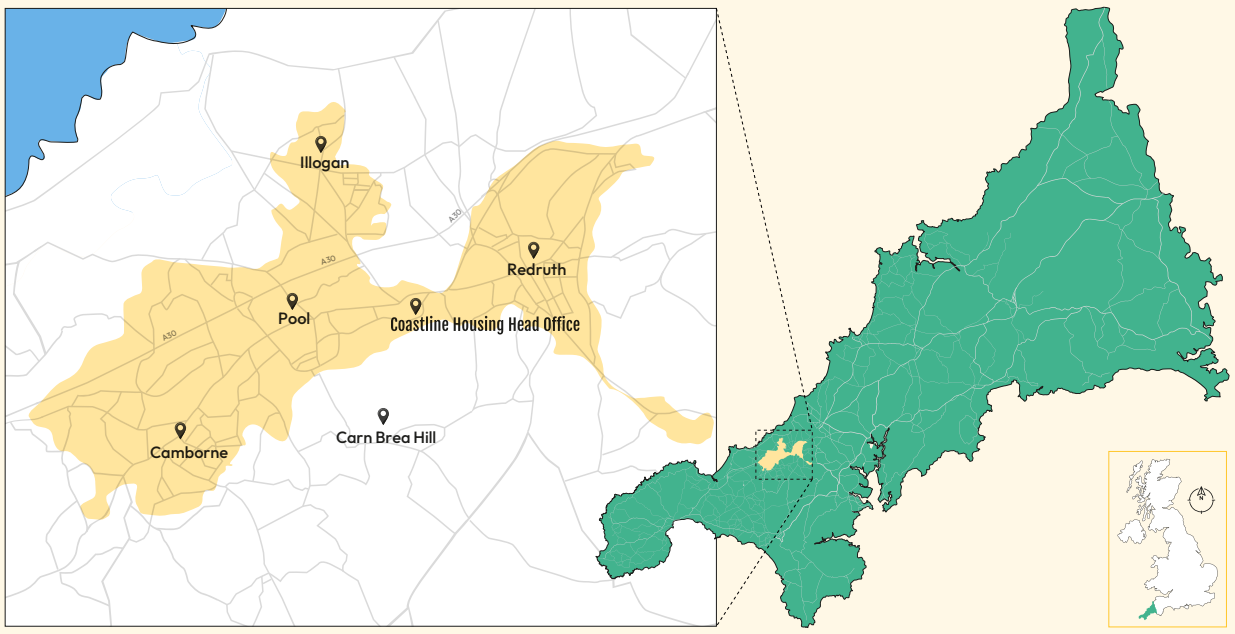
Sensor system design and usage

For 21 months between 15/06/2021 and 31/03/2023, 145 CHA homes were fitted with indoor environment sensors. These measured temperature and humidity in the living room and main bedroom, air quality (including volatile organic compounds, VOCs) and particulate matter (PM2.5) in the living room, as well as electricity usage, with readings recorded every 3-5 minutes.

The research team, CHA and residents co-designed a data dashboard, which provided insight on property risks (such as low temperature or high humidity).

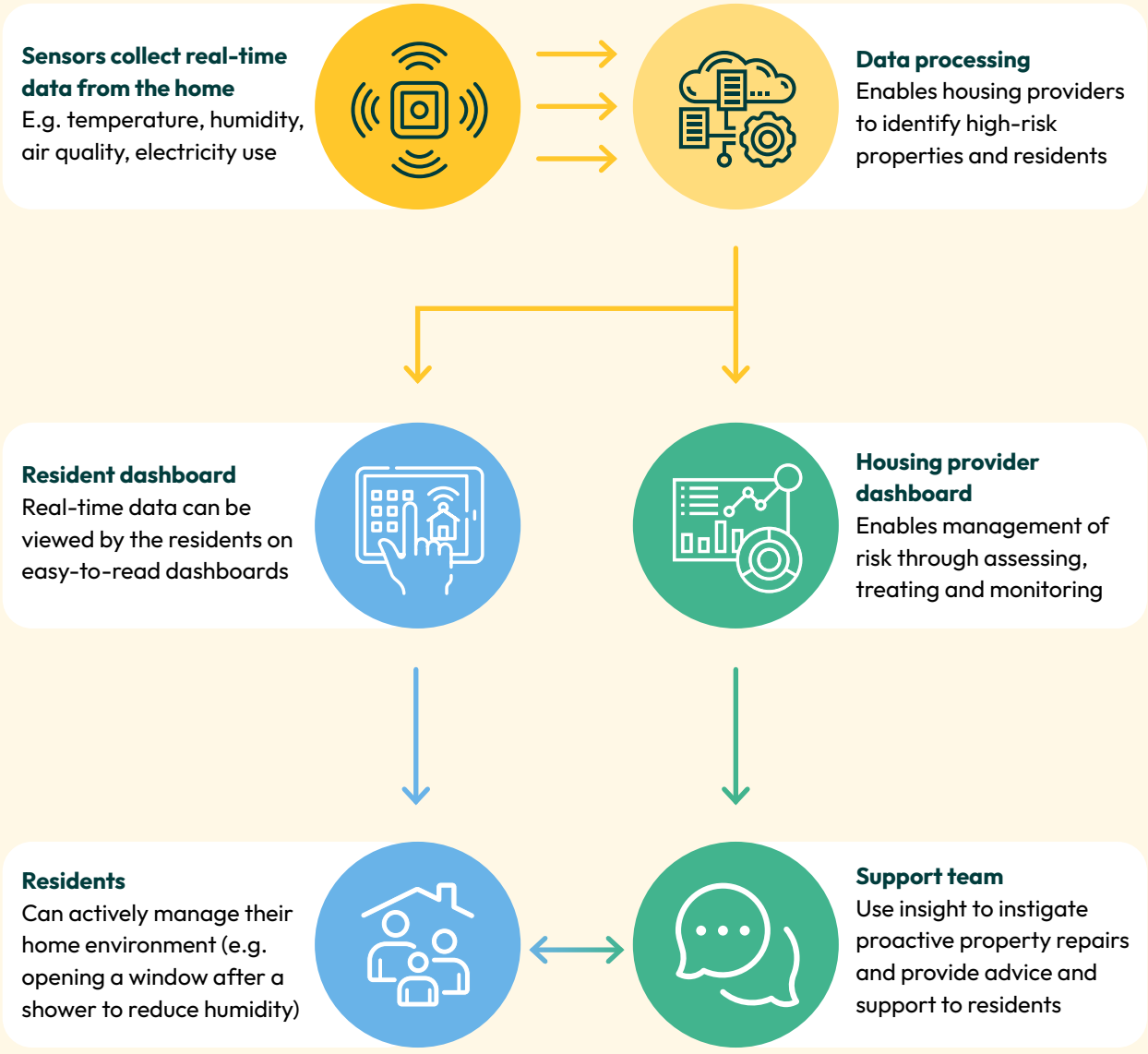
The CHA used the dashboard to identify high-risk properties through sensor readings that were concerning or irregular. They initiated a process where they would first contact the participant, and if appropriate, make a home visit to understand the issue and potentially start an investigation. Interventions included advice on the indoor environment and health, financial support to address fuel poverty and repairs or rectification work to address damp and mould.

Case study location map



How sensors in the home collect information

Sensor systems differ depending on their make; however, they all broadly work like this:



Step 1:
Establishing scope and identifying key stakeholders

The first step is to produce a clear statement about the scope and boundaries of what's included in the evaluation.

The key questions to consider are:

- What is the project background?
- What is the purpose of the evaluation?
- What resources do you have available?
- Who will undertake the evaluation?
- What activities will you focus on?
- What period of delivery will your evaluation cover?

Once you have established the scope of the evaluation, the next step is to identify and involve your stakeholders. Stakeholders are the people or organisations that experience change and/or affect the activity, in either a positive or negative way.

There are two types of stakeholders, direct and indirect.

Direct stakeholders are those who are immediately involved with delivering the activity or benefit from it. You need to engage with them to understand what the outcomes are, and what enables or hinders success.

There are also **indirect stakeholders**, those who are affected by the sensor system's outcomes or activities in some manner. While this group may not have direct control or involvement in the day-to-day activities, their perspectives, concerns and interests need to be considered and addressed.

Case study scope

The University of Exeter researchers worked with staff at CHA, HACT, and Aico-HomeLINK to establish what would be covered - the "scope statement".

Background: CHA and Aico-HomeLINK recognised the operational benefits of sensor systems, leading to their curiosity about the social value they generate and their impact on residents. This prompted further investigation into the Social Return on Investment (SROI).

Purpose: The aim of this evaluation was to quantify the social value outcomes for residents.

Resources: The primary resources included evaluation expertise from UoE and HACT, alongside input cost data from Aico-HomeLINK and outcomes data from CHA.

Who: CHA facilitated data collection, while UoE researchers and HACT conducted the evaluation.

What: The evaluation centres on CHA's use of the sensor system and the attributable outcomes for residents and their homes (those outcomes that can be robustly linked to the use of sensors).

Period: The evaluation period spanned from 15/06/2021 to 31/03/2023 (21 months), during which 145 CHA homes were fitted with indoor environment sensors. CHA actively employed the dashboard during this period to initiate repairs and provide support to residents.

Stakeholders

Identifying the **direct stakeholders** for a sensor system is a relatively straightforward exercise.There are two groups: residents and the housing provider.

Residents: This group includes individuals whose homes are fitted with sensors, directly experiencing the benefits of proactive repairs and support facilitated by the housing provider.

Housing provider: The organisation overseeing the sensor system deployment and operation, in this case CHA. This includes the executive staff involved in planning and decision making as well as the operational staff involved with installation, maintenance, data collection, repairs and resident support.

The **indirect stakeholders** include a wide range of groups. It was beyond the scope of this evaluation to engage with these groups, but they potentially offer a route to understand the secondary outcomes and ways to improve the effectiveness of sensor systems. Examples of indirect stakeholders can include:

Family and friends of residents: For instance, they might use sensor data to check on their loved ones, such as verifying if a parent has turned on the heating today.

GPs and NHS: There is an enormous amount of evidence on the relationship between a healthy home and hospital admissions.

Voluntary and community sector organisations: These organisations can help identify innovative solutions and ensures that sensor systems address the needs of the community.

Housing regulators and policymakers: Their involvement facilitates compliance and advocacy for supportive policies, promoting widespread adoption.

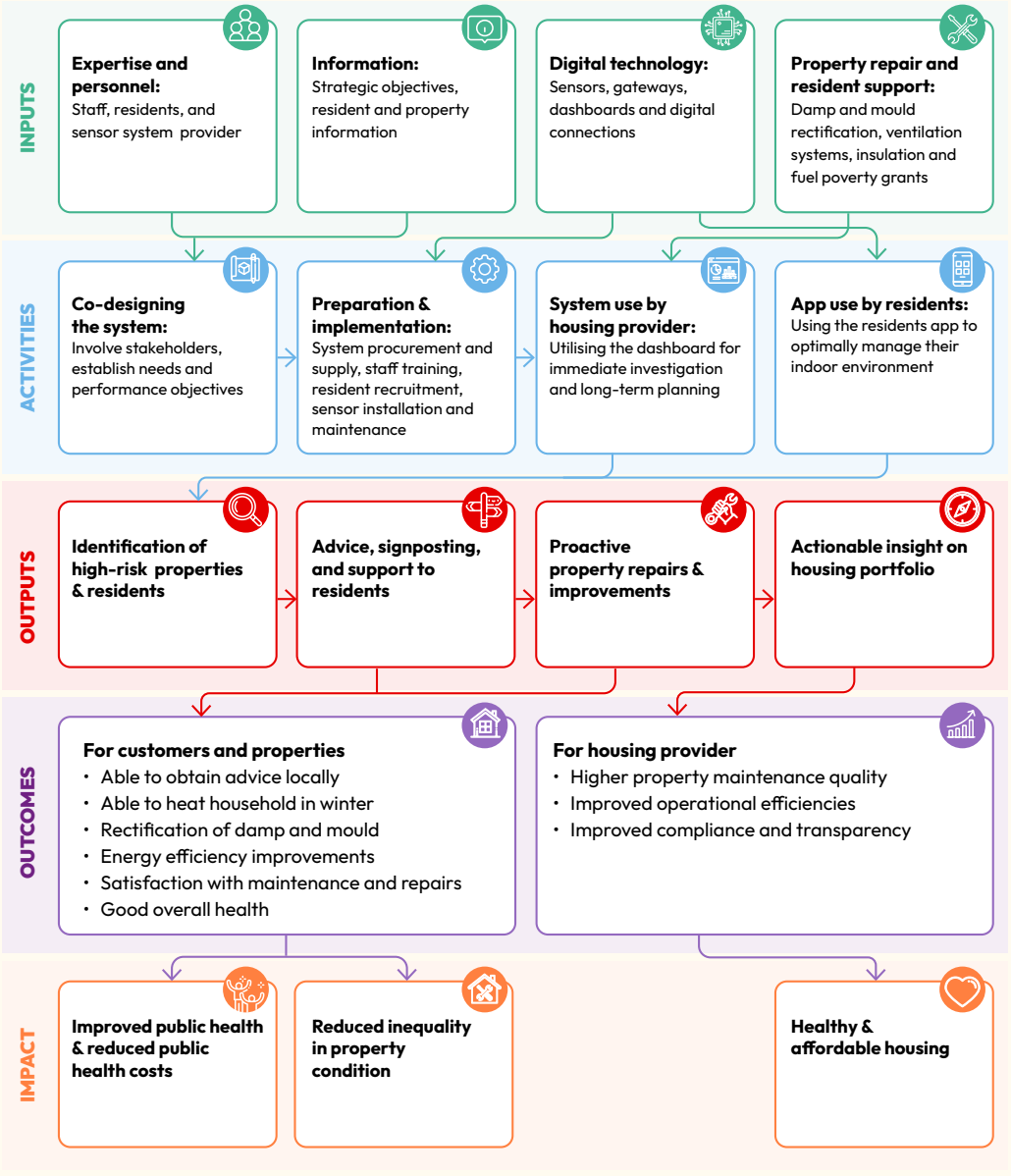
Step 2:
Develop a Logic Model

The second step is to develop a logic model in collaboration with your stakeholders. A logic model illustrates the inputs, outputs and outcomes of a sensor system using a cause-and-effect format.

This is a major component of the evaluation process. If you are considering evaluation, we have some resources to ease this step. Our first guide provides more information on how to develop a logic model for a sensor system, and we've also developed an editable logic model template for you to use. We also recommend the Value Map template available at Social Value UK in their resources library.

Sensor system logic model

In collaboration with our stakeholders, we developed a logic model for the CHA case study.



Step 3:
Evidencing outcomes and giving them a value

The third step is to collect the data that shows to what extent the outcomes have been delivered. It is good practice to collect a mix of subjective (qualitative) and objective (quantitative) data that complement each other.

If you're planning to evaluate using a social value calculator, they will have their own reporting methods to consider. For example, HACT and the UK Social Value Bank use pre- and post-intervention surveys in order to robustly and consistently report change.

Data collection

To assess the outcomes of CHA's use of sensor systems, we collected and analysed data from a number of quantitative and qualitative sources. It's important to note here is that we used alternative data and not the recommended pre- and post-intervention survey recommended by HACT.

Quantitative data sources included:

- **Resident phone call records:** to assess the advice and support provided by CHA after identification of an indoor environment risk.
- **Repair logs:** to assess the number of extra repairs which had happened as a result of identifying risks via the sensor system.
- **Resident satisfaction data:** to assess how resident satisfaction changed following proactive repairs from CHA.
- **Finance support records:** to assess the level of extra financial support (e.g. fuel poverty grants) that have been provided as a result of spotting issues in the sensor data.
- **Dashboard usage data:** to assess the frequency and duration of dashboard use by CHA staff and residents, along with the least- and most-used features.
- **Implementation and running costs:** to assess the resource costs for setting up the sensor system and the running costs for using it.

Qualitative data sources included:

- **Interviews with CHA staff:** to assess the perceived effectiveness of the system, outcomes for staff and residents, reasons for use, practical aspects to using the system and perceived cost effectiveness.
- **Interviews with residents:** to assess the acceptability of being monitored by their housing provider, perceived usefulness of the system and the outcomes experienced.

Giving outcomes a value

Once you have collected the data, the next step is to give them a monetary value. To do this you can assign financial proxies to each outcome. A financial proxy represents the relative importance, in monetary terms, of that outcome to those impacted.

There are a variety of social value calculators available to help you assign proxies to outcomes, designed for different user types. For example, The National TOMs (Themes, Outcomes and Measures) framework tailored for local governments, or the Social Value Engine (SVE) tailored for Voluntary and Community Sector Organisations (VCSO).

For this evaluation, we used the HACT Social Value Insight (SVI) tool, tailored for the housing sector, which uses the UK Social Value Bank (UKSVB). This SVI tool aligns with HM Treasury Green Book guidance, ensuring values are calculated using compliant methods and are quality assured by Simetrica-Jacobs.

The methodology notes, which explain how the proxies were calculated and how to use the SVI tool, can be found here.

Outcomes identified

The UKSVB includes 88 financial proxies across different themes: employment, community, health, financial inclusion, youth, social groups/hobbies, physical activity, homelessness, maintenance of household, maintenance of local area, environment.

Working with HACT, we identified a number of relevant outcomes. These are listed below, along with how the proxy value was calculated.

Outcome	How the proxy was calculated
Able to obtain advice locally	The value of individuals being able to obtain advice locally from someone in their neighbourhood. The proxy was calculated based on the foregone cost of obtaining advice through formal services such as the Citizens Advice Bureau.
Good overall health	The value of good health to the Exchequer. The proxy was calculated using the average healthcare cost per adult transitioning from poor health to good health in England by adjusting the overall healthcare budget to adults, then multiplying it by the increased probability of visiting the GP due to poor health.
Able to heat household in the winter	The value of a household being able to heat their accommodation in winter. The proxy was calculated based on the per person cost savings to the NHS.
Satisfaction with how landlord maintains and repairs home	The value of an individual being satisfied with landlord repairs and maintenance in their accommodation. The proxy was calculated using satisfaction data from the English Housing Survey in relation to Office for National Statistics (ONS) wellbeing data.
Rectification of serious condensation/ mould growth	Value per household of living in a home without damp and mould. Proxy based on the per household NHS cost from increased probability of developing asthma, using Asthma UK and ONS data.
Energy efficiency improvement	The value of energy efficiency in terms of improvements to a dwelling's EPC rating. The proxy was calculated using the average amount that the government will spend to improve a dwelling's EPC Band, as part of the government's pledge to get as many homes as possible to Energy Performance Certificate Band C by 2035.

Outcome results

Using the data collected, we were able to quantify the sensor system outputs and match with a UK Social Value Bank outcome.

Outputs	Outcome	Outcomes achieved
CHA identified a home as high risk, for example because of low temperature or high humidity. Residents received contact (via a phone call or home visit) from CHA and were provided with advice, guidance and support on the issue. For example, advice around managing high humidity or guidance towards energy support charities to solve low temperatures.	**Able to obtain advice locally**	40
Residents reported to CHA that their overall physical health had improved as a direct result of repairs and interventions in the home.	**Good overall health**	1
Residents received direct fuel poverty support. This included energy vouchers, hardship funding, foodbank vouchers, provision of heaters and electric blankets, discounts organised with energy providers.	**Able to heat household in the winter**	5
Residents reported an increase in satisfaction as a result of the timeliness and quality of repairs.	**Satisfaction with how landlord maintains and repairs home**	11
Residents received interventions to rectify serious damp and mould problems. Interventions included fitting Positive Input Ventilation (PIV) units, extractor fans, shower replacement, leaking pipes or radiator fixing, a new ventilation system, and mould eradication treatments.	**Rectification of serious condensation/ mould growth**	12
Residents received interventions to improve energy efficiency bands (loft insulation, for example).	**Energy efficiency improved to Band D (from E, F or G)**	1

Step 4:
Establishing impact

Step four is to establish the impact by calculating the social value generated. This involves adding up the social value being generated and then deflating according to other factors that have affected the impact.

There are two main types of deflators you need to consider, deadweight and attribution. Deadweight is about assessing whether the outcomes would have happened anyway. Attribution is about assessing how much of the outcome was caused by the contribution of other organisations or people.

This is an important part of the process in order to determine the true impact of activities. This process minimises the risk of overclaiming and enhances the credibility of the intervention. This ensures effective allocation of resources by identifying which initiatives work and which may need improvement, while also uncovering potentially overlooked stakeholders.

Explaining deflators

Here we provide more explanation on deadweight and attribution deflators, what they are and how you calculate them.

Deadweight
Deadweight is a measure of the amount of outcome that would have happened even if the activity had not taken place, calculated as a percentage. Adjusting for deadweight ensures that values reflect the actual effect of an intervention.

For example, in a housing provider's initiative that helps unemployed individuals find jobs, some participants may have secured employment through other means, regardless of the programme.

Deadweight can be calculated by comparing outcomes with a reference group or benchmark. Ideally, you can compare with the same population who were unaffected by the intervention, to determine an estimate of what would have occurred without it. You can also use data from government sources to create a benchmark, and your stakeholders can often provide valuable insights into alternative outcomes.

Attribution
Attribution is a method of assessing the extent to which outcomes can be credited to the efforts of other organisations or individuals. It is typically expressed as a percentage, indicating the portion of the outcome attributable to your organisation's actions.

This assessment is essential for understanding the specific contribution your organisation has made to the overall social value generated. It's about acknowledging that your organisation's activities may not be the sole driver of observed changes.

Achieving precise attribution is challenging. To estimate attribution, organisations can adopt several approaches:

- **Leverage experience:** Drawing on past experience and collaboration with other organisations.
- **Engage stakeholders:** Conduct surveys, focus groups, or interviews with stakeholders (including residents) to gather their perspectives on the percentage of the outcome attributable to your organisation's activities.
- **Consult with other organisations:** Collaborate with other relevant organisations to understand their contributions and allocate percentages based on their respective investments or efforts.
- **Quantitative analysis:** This can assess attribution by analysing data that identifies correlations between interventions and outcomes over time, thereby attributing specific impacts to relevant contributing factors.

Applying deflators

Here's how we applied deadweights and attribution to this case study.

Deadweight:

To establish the impact, we utilised HACT's Social Value Insight (SVI), a tool based on the UK Social Value Bank (SVB), which provides preset percentages for deadweights. Details on how these were calculated are outlined in the Methodology Note.

This deadweight calculation relies on national statistics, ensuring a large and representative sample size from the population. Essentially, this method involves comparing outcomes with a reference group, consisting of individuals unaffected by the intervention. This comparison helps estimate what would have happened without the intervention.

Attribution:

We did not apply any deflation for attribution in this evaluation. Our approach was to rigorously establish if the outcome had been a direct result of the sensor system intervention or not. If the outcome was the result of other activities, we did not include it in this impact assessment.

To establish attribution, we applied two methods. Firstly, we traced the pathway for an intervention using the dashboard data for CHA alongside information from the resident support call log and the repairs & maintenance log. Secondly, we verified that the interventions were a result of the sensor system. We did this by interviewing CHA staff and residents.

Resident stories

The numbers don't give us the full picture and leave out the human side of the interventions. Here are some personal stories about how the sensor system helped improve living conditions and health.

Reducing humidity

The sensor system dashboard reported a very high level of humidity in a family home (65-75%). A team member from CHA made an appointment to visit the family to see how they could help reduce this. The property did indeed feel humid, and all the trickle vents in the windows were closed.

The CHA colleague advised the family to keep windows open when they were at home, and organised the installation of a new bathroom fan to improve ventilation.

A surprising cause of mould

Again, the sensor system dashboard flagged that there was high humidity in a family home. This time it was even higher at up to 80%, and the highest readings came from downstairs, away from the bathroom. The home visit confirmed that the property was humid and that mould was developing.

The cause? There was a large fish tank and an open vivarium in the downstairs rooms. The CHA replaced the fans in the home, and installed a Positive Input Ventilation (PIV) system to better control the environment for the human occupants.

The cat and the latch

CHA staff noticed high humidity readings of 70-88% in one home, which were of extra concern as the resident was an elderly lady with asthma. The bedroom reading was especially high at 83.6%. When the CHA colleague visited, they found damp spores in the bedroom walls: a broken latch on the window meant that the resident couldn't open the window, as her house cat would escape.

The solutions were straightforward but impactful. The mould was treated and the window was repaired, so it could be opened without the cat escaping. Shortly afterwards, the lady told CHA about improvements to her physical health:

"I was coughing and needing my blue inhaler more. I now only use it before my fitness class and when symptomatic with my asthma... I was also getting itchy eyes and they would puff up. That too has stopped...Thank you so much for your help - my health has improved as a result."

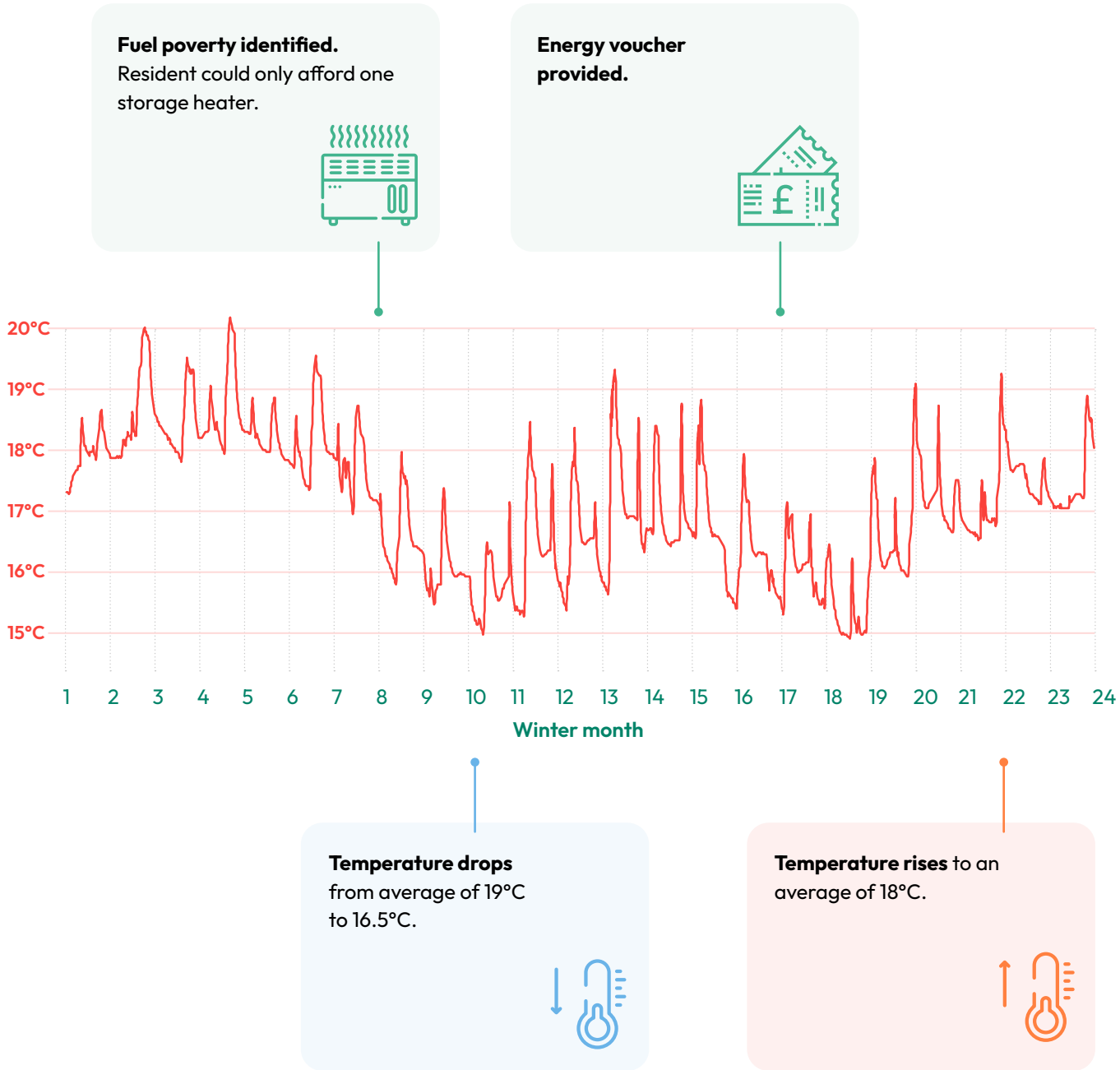
Warming a cold home

This dashboard showed a disturbing drop in temperature in a family home. A conversation with the CHA colleague revealed that the family was now in fuel poverty due to changes in their circumstances and a loss of income and benefits. The house had a high-rated EPC, however the CHA inspector found that the loft installation had been removed by the previous occupant, resulting in higher energy costs.

The team was able to help the family find financial support, such as the Coastline Emergency Hardship Fund and the Council's Covid Winter Grant. A local charity supplied a heated throw and energy vouchers. A change in energy supplier and a Warm Home Discount also helped towards bills. CHA replaced the missing insulation.

Observing impact in the sensor data

The impact of interventions to improve homes and support residents can also be observed in the sensor data. Here's a chart showing how a resident who faced fuel poverty was helped.



The WHO suggests that 18°C is the ideal temperature for healthy and appropriately dressed people.

Social value impact results

Working with HACT, we used the Social Value Insight Tool to calculate an indicative assessment of the social value impact in the CHA case. In order to ensure that HACT's social value metrics remain UK Government Greenbook compliant, they are regularly updated. To ensure these are used in accordance with HACT's licence, please refer to the website.

To explain the column headings in the table below:

Exchequer value – this is the indirect impact on the public purse from an Exchequer point of view.

Wellbeing value – this is the direct impact to an individual in terms of wellbeing and quality of life.

Deadweight - this is the probability that this outcome would have happened anyway and is applied to social value calculations.

Total Social Value – this is Wellbeing Value plus Exchequer value (and includes the deadweight that has been applied to the wellbeing value).

	Outcomes achieved	Exchequer	Wellbeing	Deadweight	Total Social Value
Able to obtain advice locally	40	£2,840	£108,080	9%	£100,937
Good overall health	1	£653	£20,138	17%	£17,257
Heat household in winter	5	£657	£67,315	55%	£30,956
Satisfaction with landlord maintenance	11	£308	£28,358	38%	£17,773
Rectification of mould	12	£2,280	£75,660	0%	£77,940
Energy efficiency D (from E,F,G)	1	£77	£2,308	0%	£2,385
				Total Social Value	£246,887

Step 5:
Calculating the Social Return on Investment (SROI)

The fifth step in the process is to calculate the Social Return on Investment (SROI).

SROI is a measure that assesses the social value generated by an investment. It quantifies the positive impact of an activity, intervention or initiative on society, in relation to the resources invested.

This stage involves adding up all the benefits, subtracting any negatives and comparing the result to the investment.

In simpler terms, SROI provides a way to gauge how well an investment contributes to positive social outcomes, allowing stakeholders to understand and compare the effectiveness of different projects in creating social value.

SROI aggregates the economic value of the costs and outcomes that arise from an intervention, expressed in a return-on-investment ratio.

SROI is about value, rather than money - money is simply a common unit and as such is a useful and widely accepted way of conveying value.

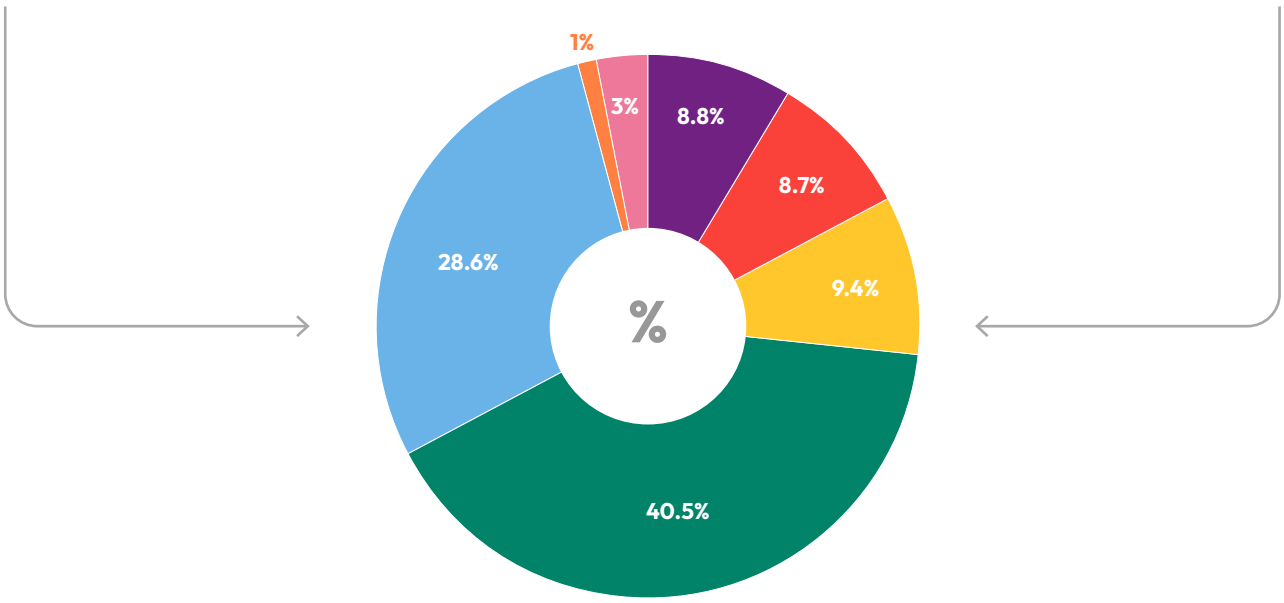
To calculate the SROI, you firstly need to know the input and running costs.

Input costs

We collaborated with Aico-HomeLINK to cost the sensor technology, as well as with CHA to cost the required personnel (the costs we use here are accurate as of 2024). By talking with housing providers who use sensor systems, we found out that over time, the staff costs associated with using the system go down. This happens as the system becomes integrated into everyday operations and becomes the norm, used by a growing range of staff teams.

Input costs for 145 homes for 21 months.

Input	Cost Rationale	Cost
Sensor project manager Responsible for managing the set-up, delivery, and running of the sensor system project. Including managing the sensor project coordinator role.	A manager level role with an annual salary of £50k. Role requires 4 hours per week.	**£8,077.44**
Sensor project coordinator Responsible for sensor dashboard monitoring, customer liaison and support, and intervention coordination. Trained on indoor environmental conditions (e.g. damp and mould and energy efficiency), digital processes, and reporting.	A non-manager level role with an annual salary of £25k. Role requires 1 day a week.	**£8,076.6**
Electrical contractor Responsible for installing and maintaining sensor system.	Installation takes 1-2 hrs per home. Cost between £40-£80 per property, depending on local costs and contractors experience. Average cost for one property = £60	**£8,700**
Ei1025 Environmental Sensor Collects data on temperature, Humidity and Carbon Dioxide.	Two sensors per home were installed by CHA in the main living room and bedroom 2 x Ei1025 = £257.26	**£37,302.7**
Ei1000G SmartLINK Gateway The Gateway provides the mechanism for data transfer and remote data management.	One Gateway per home is required. 1 x Ei1000G = £181.91 per home.	**£26,376.95**
Customer electricity payment Running the SmartLINK Gateway requires electricity.	A payment to the customer to cover the running costs of Gateway. 1 x £3.50 per year per customer is recommended by Aico-HomeLINK.	**£883.05**
Software and data The HomeLINK software (i.e. data dashboards) includes a dashboard for the housing provider and the resident's application.	1 year of data and software included with sensor purchase. Post Year 1 - Annual Subscription is £8.00 for Ei1000G and £5.50 for Ei1025 (per unit)	**£2755**
	Total	**£92,171.1**



The Social Return on Investment for a Sensor System

Coastline Housing Case Study

Inputs and outcomes for a sensor system covering 145 home for 21 months.

Inputs

Sensor project manager	£8,077
Sensor project coordinator	£8,077
Electrical contractor	£8,700
Environmental sensors	£37,303
Gateway	£26,377
Customer electricity payment	£883
Software and data	£2755

Total input costs
£92,171

Outcomes

Able to obtain advice locally	£100,937
Good overall health	£17,257
Heat household in winter	£30,956
Satisfaction with landlord maintenance	£17,773
Rectification of mould	£77,940
Energy efficiency D (from E,F,G)	£2,385

Total social value generated
£246,887

SROI = 2.68

For every £1 spent on a sensor system, **£2.68** worth of social value is generated.

Step 6:
Reporting, using and embedding

The sixth step involves sharing the findings with stakeholders, responding to feedback and embedding the learning within the organisation. This is an easily forgotten step.

Step 6 is important because the process of understanding the intervention and engaging with stakeholders can yield important insights, as valuable as the SROI result itself.

Our suggestions for step 6 and how the evaluation can be used are:

- Highlight social purpose and resident engagement.
- Enhance reputation and trust through transparent reporting.
- Integrate insights into policies, training, and future projects.
- Make data-driven decisions for sustainable impact.
- Support strategic planning and funding applications.
- Evidence compliance with healthy housing regulations.

Conclusion

Environmental sensors offer an affordable and effective means to identify health risks in indoor environments. However, their adoption remains low among housing providers. There is still limited knowledge of the role a simple sensor system can play in improving the health of the home environment.

And that's where case studies like ours come in. Our case study demonstrates how residents, their housing provider and the CHA staff have adopted using a sensor system, and how effective it's been to mitigate problems. Positive perceptions among staff suggest these systems should be standard in housing.

Strategically, our study demonstrates the potential of sensor systems to improve indoor conditions and address health risks in underserved communities. This can be achieved through investing in partnerships across the housing, health and voluntary sectors.

Additionally, the case study highlights the potential of internal environmental data to identify behavioural patterns. There's a need to develop clear and ethical protocols before integrating sensor systems into homes.

By measuring the SROI through an evaluation like this one, you can demonstrate the value of an intervention, hopefully leading to wider adoption and investment.

Resources

This is the final guide in the series on the social value of home sensor systems.

The other resources in this series of guides are:

Guide 1: The Social Value of Home Sensor Systems: An Introductory Guide

Guide 2: How Home Sensor Systems Generate Social Value: An Evidence-Based Guide

Guide 3: Evaluating the Social Value of Sensor Systems: Case Study and Guide (this one)

An editable "Logic Model" that you can use to plan and evaluate a sensor system project

Open source publications: The research which underpins this series of guides can be accessed at the Smartline site and at the European Centre for Environment and Human Health.

About us

We're a transdisciplinary team of researchers based at the University of Exeter. We draw on experience from the Smartline and SenseWell projects, which studied how digital technology can support healthy homes and connected communities.

Please get in touch if you have innovative housing and health project ideas!

UKRI Engineering and Physical Sciences Research Council

The Engineering and Physical Sciences Research Council (EPSRC) supported this project through its Translational Funding scheme. This funding aims to speed up the practical application of university research through collaborative projects with partners outside of academia.

University of Exeter

A multidisciplinary team of researchers based at the European Centre for Environment & Human Health at the University of Exeter. The Exeter team is drawn from the Smartline project, which studied how digital technology can support healthy homes and connected communities.

HACT

The Housing Associations' Charitable Trust (HACT) is a leading charity in the social housing sector that drives the creation of social value for communities and individuals through insight-led products and services.

Coastline

This not-for-profit housing provider in Cornwall (UK) manages over 5,000 homes. The housing association is a long-term collaborator with the University of Exeter, working on numerous health and wellbeing initiatives.

aico®

As a market leader in European home safety technology, Aico has been a crucial collaborator on this series of guides. They provided expertise, finance and information, as well as providing costings for our social return on investment models.

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