



GUIDE 1

THE SOCIAL VALUE OF HOME SENSOR SYSTEMS

An Introductory Guide



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About this guide

This guide is an introduction to the social value that home sensor systems can generate. It's produced specifically for housing providers (including Housing Associations, Local Authorities and Arms Length Management Organisations) to help planning, maintenance and procurement teams forecast the wider impacts of installing sensors in their social housing.

The research in this guide is mainly drawn from the social housing sector. However, the insights are also relevant to various other housing providers.

The guide is the first part of a series that is made up of:

- **Guide 1:** The Social Value of Home Sensor Systems: An Introductory Guide (this one)
- **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
- An editable "Logic Model" that you can use to plan and evaluate a sensor system project

We'll cover how sensor systems can be used to make homes safer and healthier, for example, by being less vulnerable to damp and mould. We'll also look at how housing providers can collect data to measure the social value generated.



What is 'social value'?

Social value is the measurable wider benefits of an activity, beyond the financial. It's a way to quantify how different interventions positively affect people's lives. By measuring social value, we can assess whether an intervention is in society's interest.

In this case, we can look at the positive impact that proactively supporting home environments has on residents and communities, as well as benefits for wider services such as the NHS and public housing.

These social value measurements not only help you evaluate the impacts of the sensor system, they can also provide essential information for future funding, grants and budget allocations.

The benefits of measuring the social value for housing providers are:



Social purpose:

Demonstrating that activities are addressing residents' needs and delivering on social purpose



Resident voice:

Evaluating social value provides opportunities to hear the residents' viewpoints



Decision making:

Understanding which activities are driving effective and sustainable impact



Reputation:

Demonstrating a commitment to addressing community needs, which builds trust



Regulation:

Aligning with regulatory requirements (such as healthy housing regulations and the Social Value Act)



Financial:

Gaining better financial options and creating a competitive advantage

The benefits of installing sensor systems

The risks of condensation, mould and damp in the home

The problems caused by damp and mouldy living conditions are now well understood. Black mould, for example, releases harmful toxins and can cause serious health problems such as asthma attacks. Damp and mould also have a detrimental effect on the fabric of the buildings, at a financial cost to housing providers.

Older housing stock and the generally damp British climate contribute to the problem. In some cases, residents are unable to adequately heat or ventilate their homes (fuel poverty is a growing problem), and older buildings may have insufficient insulation, draughty windows or poor air circulation.

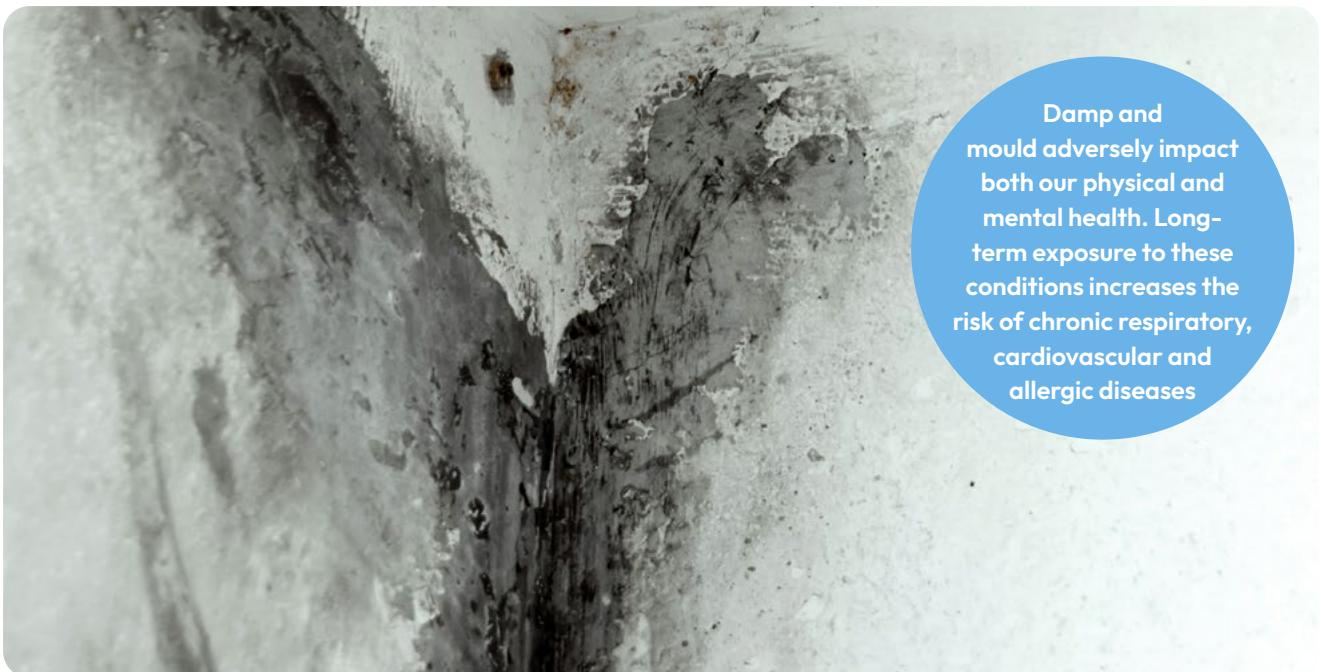
We are not equally affected by the quality of our indoor environment. Vulnerable groups such as individuals with respiratory ailments, compromised immune systems, infants, young children and the elderly face heightened risks. Urgent action is needed to reduce risks to health, particularly for these vulnerable groups, helping to address health inequalities. However, it's important to acknowledge that housing providers may not be fully aware of the health conditions present in each household.

This problem was brought to the wider attention of the public in the most tragic way with the death of two-year-old Awaab Ishak. The coroner concluded this was caused by damp and mould in his home. An amendment to the Social Housing Regulation Bill, called Awaab's Law, will require social landlords to fix damp and mould within strict time limits. A sensor system supports compliance by proactively identifying the households most at risk.

How sensors can help

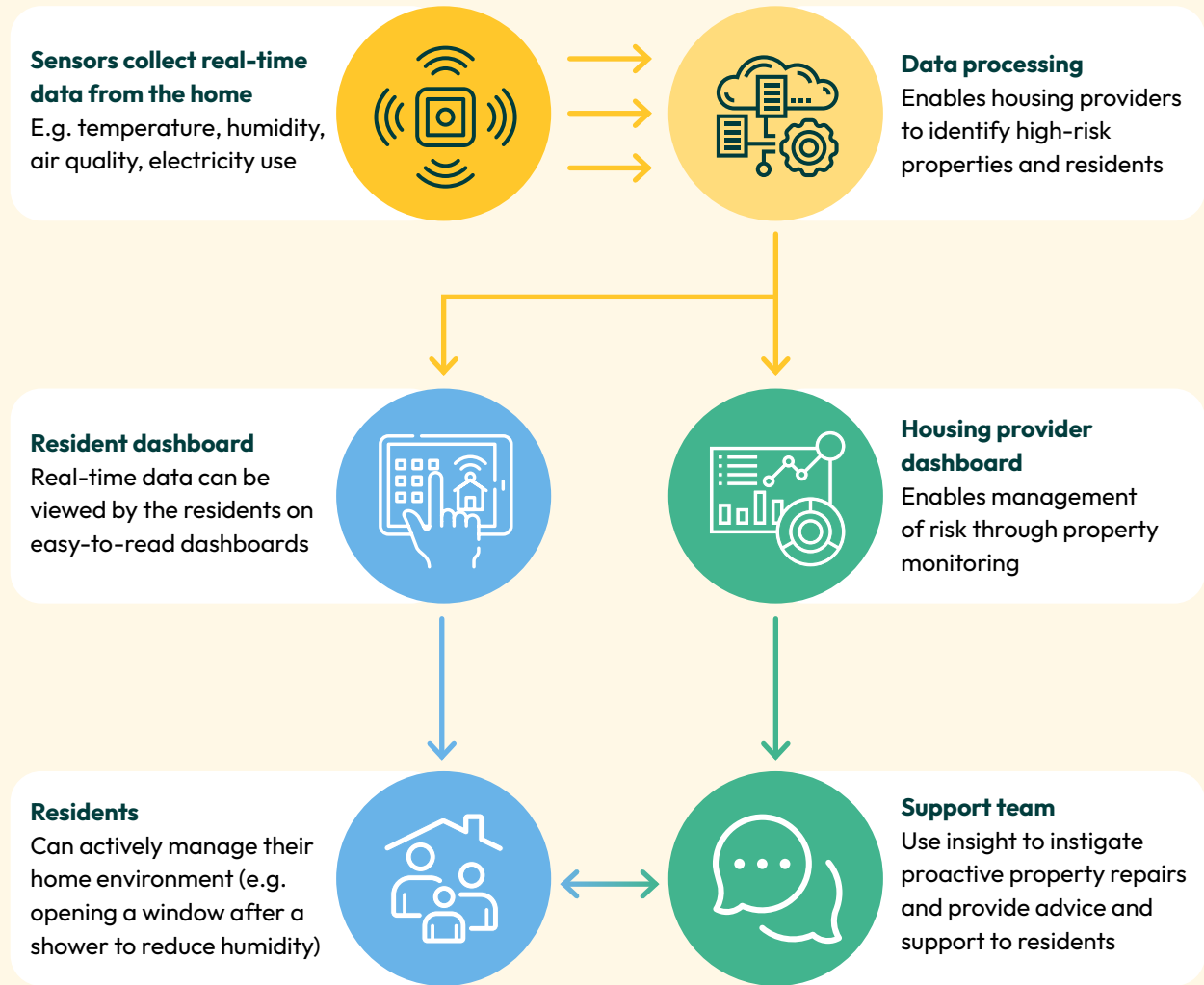
How can we reduce the risks caused by damp and mouldy conditions, poor ventilation, or underheated homes? The key lies in monitoring the indoor environment, which enables housing providers and residents to act on early warning signs.

A sensor system can collect data on a range of environmental factors within a home, such as temperature, humidity, air quality and CO₂. By collecting and transmitting real-time data, the sensor system helps housing providers manage risks proactively, while also allowing improved diagnosis of the causes of the poor environments, which can be complex.



How sensors in the home collect information

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



Social value: measuring the benefits of sensors in homes

What are the benefits of monitoring and proactively supporting residents?



Improved physical health of residents



Improved mental health of residents



Better-quality housing stock

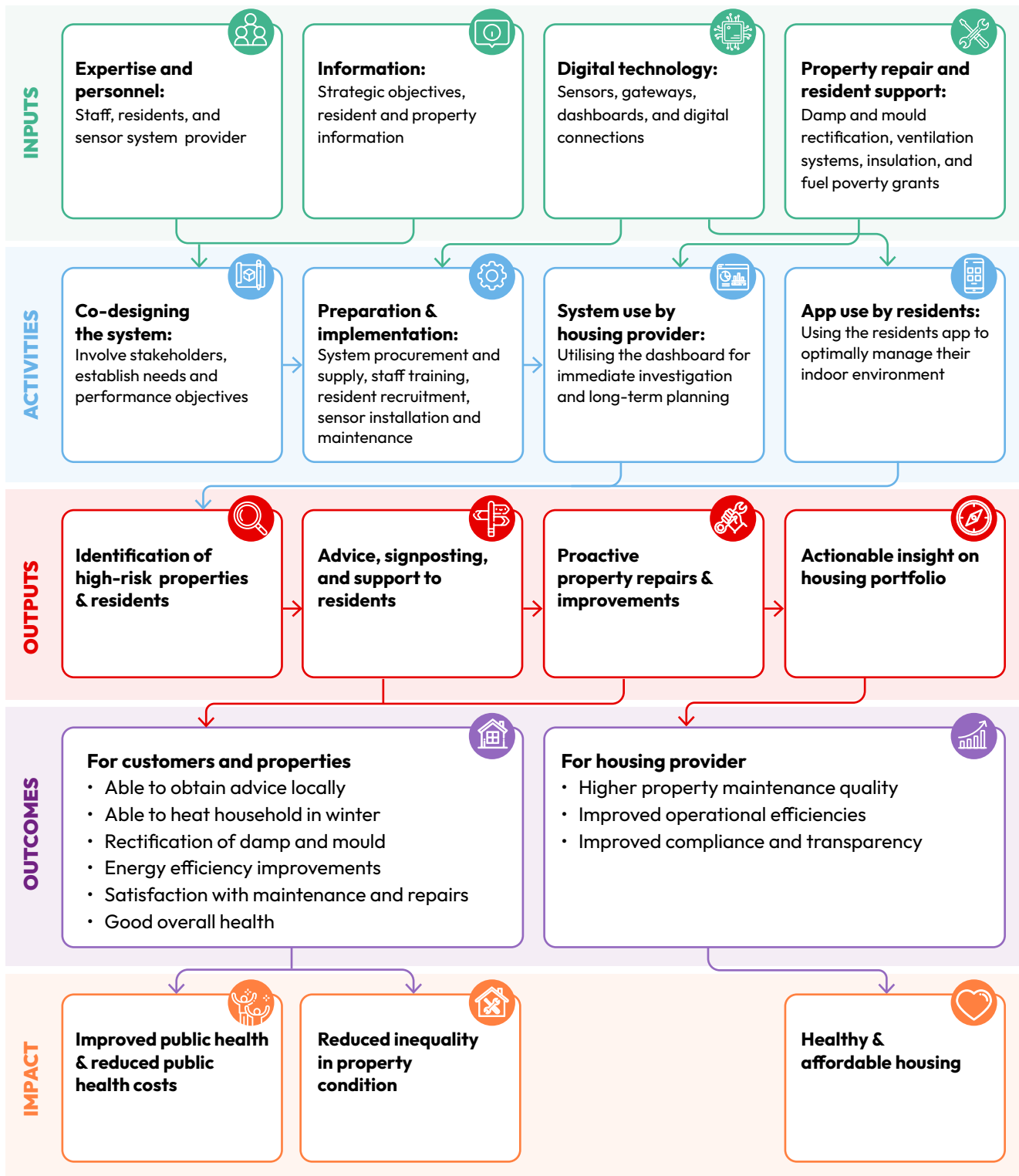


A proactive approach to maintenance

Introducing the Logic Model

The Logic Model visually outlines the resources and activities essential for implementing a sensor system intervention, alongside the outputs and outcomes.

Through illustrating cause-and-effect relationships, it improves understanding of the sensor system's impact and the generation of social value.



Inputs

What resources do you need to implement a sensor system?

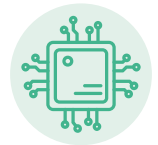
Information and planning

- Business objectives, values, and sustainability strategy: the design of the sensor system should align with these
- Regulations and standards for healthy homes: the sensor system will help you meet these
- Property performance and energy information: think “worst first” when choosing properties
- Resident information on vulnerability and complaints: helps identify groups which would most benefit from the system



Technology and equipment

- The sensors: we recommend three sensor units per home (kitchen, bathroom and living room)
- A gateway device to transfer the data
- Digital dashboards for the housing providers and residents
- A budget allocation to pay the residents for electrical costs incurred by the gateway



The right people and expertise

- Sensors system project manager. Responsible for managing the set-up, delivery, and running of the sensor project
- Resident support and property repairs coordinator. Responsible for sensor dashboard monitoring, resident liaison and support, and repairs coordination.
- Sensors system provider
- Electrical contractor. Responsible for installing and maintaining the sensor.
- Property repairs and maintenance team. Responsible for keeping properties safe, secure and in good condition



Property repair and resident support resources

- If issues are identified by the sensors, you'll need to have a maintenance team - and budget - in place to respond to those issues.
- It's also worth taking into account that there may be an initial increase in repairs (such as mould eradication treatments or new ventilation installation). Over time, repair costs should decrease, thanks to the proactive approach to maintenance.



“It’s better to work on a problem, not a crisis.”



Activities

What do you need to do to set up and run a sensor system?

Now that all the initial resources are in place, the “activities” are what we do with them to reach the right outcomes.

Collaborative design

Experts from your team (ICT, maintenance, procurement) can work with the sensor provider to design a system that meets your business objectives and strategies. Involving the residents at the earliest opportunity is good practice to improve decision making, transparency and conflict mitigation.



Identifying and recruiting households

Identifying which households are involved in the initial rollout depends on your objectives. Using resident information on vulnerability, complaints and repairs can help identify the households that would most benefit. Resident communication is important at this stage to increase awareness, knowledge and acceptance of sensors.



Installation

Sensors will need to be installed by a trained electrician. It's recommended that sensors are fitted on a wall at 1.4m height to get the most reliable readings. Installation takes around an hour per home, so you'll need a scheduling plan for resident appointments.



Ongoing resident support

Resident support is crucial for a successful sensor system. If an issue is identified, it's important to communicate with the resident, understand the context and cause and in some cases, arrange a property investigation. Providing residents with advice and guidance can help them take their own actions to solve issues. Even just simple ventilation behaviours can help reduce problems.



Proactive responses to data

If the sensor system is to be a success, repair and maintenance interventions have to be prompt. Consider embedding the data and notifications within your existing systems, such as repairs and Customer Relationship Management (CRM).



Outputs

What should you expect from your sensor system?

Outputs are the direct and immediate results of interventions. For example, this could be how many risks were identified and what repairs were carried out in response to this information.

Documenting and measuring the outputs is invaluable for explaining the sensor system to stakeholders and is essential for assessing the social value. The most robust method is to use established pre- and post- intervention surveys. HACT and the UK Social Value Bank provide these as part of their methodology. Other social value calculators are available, like the National TOMs, each with their own reporting methods.

The key factors to consider when choosing a social value calculator are: does it include the relevant metrics to capture the expected outcomes, robustness and validity, and does it align with your organisation's reporting standards? (See guide 3 for more guidance on evaluation).

When evaluating social value, you need to be clear to what extent the sensor system is responsible for specific changes and positive outcomes.

The table below lists the key outputs that should be reported on.

Key outputs	Types of data to collect
Scale of sensor system	<ul style="list-style-type: none"> • Number of homes with sensors • Types and number of rooms with sensors • Number of sensors in total
How the system is being used	<ul style="list-style-type: none"> • Number of users (both staff and households) • Frequency of use of dashboard • Length of log-in times • Most and least used features
Risks identified	<ul style="list-style-type: none"> • Number of risks identified by the system • Types of risk identified, e.g. cold home or poor air quality • Number of residents contacted re: risks • Number of onsite property investigations
Advice and support provided	<ul style="list-style-type: none"> • Number of residents given advice relating to keeping their homes warm and well ventilated • Number of residents signposted to support services, e.g. energy or financial advice charities

Outcomes

What are the benefits of a sensor system?

You've installed the sensors, identified and acted upon any risks, and collected data about the outputs. What are the wider outcomes of using a sensor system?

Through our research, we have identified the key outcomes. For housing providers, there are organisational and financial benefits. For residents, there are health and wellbeing benefits, which have a social value.

For housing providers

- Better-quality housing stock
- Risks and maintenance needs are identified quickly
- Able to identify high-risk properties
- Improved resident service and satisfaction
- A more efficient way of working
- A gradual decrease in maintenance because mould and damp are proactively managed
- Improved compliance with regulations

For residents

- Able to access advice and support locally
- A warmer, healthier home environment
- Mould and damp (both existing and potential) identified and treated or prevented
- Access to an improved maintenance service
- Able to better self manage temperature and humidity, through information from the sensors
- Improved satisfaction with their housing providers

Take a look at [Guide 3](#) to see worked examples of sensor system outcomes.



Impacts

What is the wider social value of the sensor system?

What are the social impacts of creating a healthier indoor home environment? These are the broader impacts of your sensor system.

For example, improved living conditions lead to a reduction in damp-related problems like asthma. As well as being life-changing for the individual, this means that hopefully they won't need as many health interventions, reducing costs and pressure on health and social care services.

With properties being proactively managed and repaired, there is a reduced inequality in property conditions across housing stock. Through the improvement in the quality of property maintenance and operational efficiency benefits, the wider impact will be on healthier and affordable social housing.

By measuring social value, housing providers can ensure their impact aligns with their long-term goals and organisational values.



Improved public health and reduced public health costs



Reduced housing inequality



Healthy and affordable housing



Risks and considerations for housing providers

We've talked about the good that sensor systems can do. However, as with any new tech, there are also risks and other factors to consider when introducing sensor systems. Here are a few things to keep in mind, as suggested by experienced organisations:

- Installing large volumes of sensors in a housing network could have adverse outcomes if teams aren't prepared to cope with the influx of new dynamic information
- Sensor networks require staff who are able to review and manage information while supporting customers, in particular when onboarding properties
- Sensor network data should be treated in the same way as other communications, and brought into the business as tasks through the Customer Relationship Management / Repairs systems
- Companies that are considering installing large scale sensors should first consider whether they (1) buy, install, maintain, repair and manage the sensors and data or (2) pay for a data service provider to install, maintain, repair and manage the sensors and data. Pros and cons exist for each option, and the right decision depends on the housing provider's resources and expertise
- All companies should consider sharing data with research organisations such as universities to produce examples of good practice

Summary

This guide has introduced you to the social value of sensor systems, and how you can use the logic model to help you plan the key interventions.

By working through the components of the Logic Model, you'll be able to communicate the positive impacts of the sensor system solution clearly and concisely to all stakeholders. You should now have a clear idea of the social value impacts that the sensor systems will generate.

You are also aware of how to start capturing data during the project. It's important to set up robust reporting methods at the earliest opportunity. If you're planning to assess social value, we suggest studying the resources at Social Value International in the first instance. See our third guide for more details on evaluation.



Resources

This leads us to our next guide, *How Home Sensor Systems Generate Social Value: an Evidence Report*, which maps out in-depth the relationships between the problems and the best strategy for achieving social value.

The other resources in this series of guides are:

Guide 1: The Social Value of Home Sensor Systems: An Introductory Guide (this one)

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Guide 3: Evaluating the Social Value of Sensor Systems: Case Study and Guide

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!



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.



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.



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.



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.



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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