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Internet of Things (IoT) Sensors for Damp and Mould

A comprehensive review of insights and lessons across London boroughs

Authors: Will Bibby and Laurie Blair
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Executive Summary

The Damp and Mould Sensor Project is an ongoing initiative started in March 2024 aimed at addressing damp and mould in social housing through the use of IoT environmental sensors.

Led by London Office for Technology and Innovation (LOTI) and the Greater London Authority (GLA), the project supported 16 London boroughs to install 155 sensors across their housing stock to monitor environmental risk factors associated (i.e. temperature and humidity) in order to provide insights for damp and mould risk. A further 4 boroughs participated in the broader collaboration.

This evaluation assesses the deployment, use, and impact of the sensors, with a focus on identifying benefits, challenges, and actionable recommendations for future scale-up and adoption by other local authorities.

Most promising use cases for replication and scale:

- **Proactive and early identification of risks:** an early warning system for detecting conditions conducive to damp and mould early, enabling preventive action.
- **Damp and mould diagnosis and repair assessment:** Identifying root causes and evaluating the effectiveness of interventions.
- **Resident engagement and behaviour change:** Sharing insights with tenants to facilitate engagement, foster collaboration and encourage preventative behaviours.
- **Predictive maintenance:** Using data to forecast when repairs are needed to enable more predictive interventions, especially when combined with other datasets.

Key Benefits

1. **Enabling quicker, preventative action:** sensors allowed councils to identify at-risk properties earlier, shifting from reactive to proactive management. This reduced the likelihood of severe cases, costly repairs, and tenant relocations.
2. **Improved support for vulnerable residents:** Sensors enable councils to proactively identify and support vulnerable residents, addressing unseen damp and mould cases, fuel poverty, and broader tenant challenges through a holistic, multi-team approach.
3. **Addressing underlying causes of damp and mould:** sensors provided insights into environmental conditions that helped councils diagnose underlying causes and implement targeted, effective interventions.
4. **More efficient use of housing officer time:** remote monitoring reduced unnecessary inspections and repeat visits, enabling housing teams to focus on high-priority cases.
5. **Improved resident engagement:** data insights facilitated meaningful tenant engagement, fostering trust and collaboration.
6. **Financial savings:** while quantifiable savings are preliminary, projections suggest significant annual savings as a result of fewer severe cases, reduced property call outs, optimised inspections, and reduced legal expenses.

Recommendations

1. Building the evidence base and business case for scaling sensors

A. Extend the project through the winter months
B. Expand the project to test at scale
C. Develop a London-wide business case framework
D. Facilitate learning and evidence sharing across boroughs

2. Strengthening resident engagement through sensor data

A. Secure resident consent during installation to build trust
B. Ensure tenants have access to sensor data to increase transparency
C. Develop and test communication strategies that encourage behaviour change
D. Co-design engagement tools and processes with residents

3. Establishing processes for responding to sensor data

A. Define a clear strategy and vision for using sensor data
B. Integrate sensors into existing workflows and customer pathways
C. Develop standardised best practice for managing and responding to insights

4. Bringing in the right roles and capacity to scale

A. Invest in effective programme management to coordinate delivery
B. Allocate dedicated resources for data management and analysis
C. Further automate monitoring and reporting, where possible
D. Provide training and clear guidance to frontline employees

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1. Introduction

1.1. Overview of the project

The London Office for Technology and Innovation (LOTI) and the Greater London Authority (GLA) are collaborating to enable the rapid deployment of internet of things (IoT) sensor technology to improve the quality of London's housing stock.

The **Damp and Mould Project** is an ongoing project with 20 boroughs. 16 were provided with 10 environmental sensors each and were free to deploy the sensors as they chose within their housing stock. 4 boroughs shared insights from their independent deployment of sensors.

The purpose of this evaluation is to evaluate the deployment, use and effectiveness of IoT damp and mould sensors across the participating London councils.

Specifically, the evaluation aims to:

- **Understand how boroughs have deployed and used damp and mould sensors.**
- **Explore what benefits and challenges councils experienced during the project.**
- **Identify the most promising and impactful use cases for replication and scale.**

See Annex A for a copy of the evaluation framework and logic model used as the basis for this assessment.

1.2. Methodology

The evaluation is based on 16 semi-structured interviews with borough housing and data teams across 15 participating councils, in addition to the sensor provider IoT Solutions Group. See Annex B for a list of boroughs interviewed.

We used thematic analysis to identify themes, patterns, and variations in deployment strategies, use case effectiveness, and operational benefits and challenges (Braun and Clark 2004). In addition, we conducted a use case analysis to identify and categorise a range of use cases for the damp and mould sensors.

Finally, we undertook process mapping to compare "before" and "after" processes to assess any changes enabled by sensors

We draw on the Process Mapping method used by **Jacobs** in their assessment of the Glasgow City Region's Smart and Connected Social Places Programme. This involved understanding and mapping councils' 'as is' processes for identifying and managing damp and mould, and using evidence from how sensors were used to sketch out a potential process map integrating sensor insights based on key use cases.

2. How boroughs used damp and mould sensors

2.1. Implementation: how were sensors deployed and managed?

A total of 170 sensors were sent to 17 boroughs, of which 159 sensors were deployed as of January 2025.

11 of the 15 councils interviewed reported prioritising the most serious or difficult cases such as properties with recurring issues. Some councils, such as Redbridge, chose different types of properties, including bedsits, low rise flats, high rise flats and maisonettes, as well as properties with solid or cavity walls. A couple of councils deployed the sensors in temporary accommodation, and Islington chose empty properties with communal heating systems for some of their sensors.

Measure	Total
Total sensors ordered as part of the project	**200**
Sensors distributed to participating boroughs	**170**
Total sensors deployed in council housing stock	**159**
Sensors not yet utilised	**10**
Sensors distributed to boroughs as replacements	**9**
Sensors held as contingency	**11**
Sensors returned by boroughs	**10**

Several councils, such as Barking and Dagenham and Hillingdon, deployed the sensors in different parts of the borough to ensure a geographical spread, and some targeted ageing or at risk housing stock in need of investment, such as properties with poor insulation or low damp proofing. Hounslow also used holistic data to create a list of residents to approach 'based on complaints, disrepair cases, and areas of deprivation as identified by other projects'.

Most councils deployed just one sensor in each property.

Some were 'located in either a problematic room or centralised area in the property', whereas some were put in similar types of places from property to property. A handful of councils put multiple sensors in one property, including RBKC (Royal Borough of Kensington and Chelsea), who used two for larger properties. Barnet who deployed around 1000 AICO sensors as part of their own trial, 'put 3 - 4 in each property, so places like the kitchen, bathroom, living space, so [they could] get granularity.' This also helped with false readings, because if all the sensors are giving the same reading they can be sure it is accurate.

Although sensors are designed to only be used in individual properties, we heard from a few councils, such as Hounslow or Merton, that they wanted to redeploy sensors to different new properties. For example, RBKC reported deploying 10 sensors across 30 different properties. Finally, several councils such as Camden and Waltham Forest reported having to take a more ad hoc and less targeted approach to deployment, using their networks to ensure sensors were installed wherever possible within the timeframe.

The sensors were deployed mostly by housing officers or surveyors, as well as an in-house contractor at Hammersmith and Fulham and the purchasing team at Hackney.

Ealing Council also had a third party called 'Zap Carbon' install an additional 50 sensors, on top of the 10 sensors from IoT Solutions.

A small number of councils involved the residents in the installation process, requiring them to remove a battery inhibitor tab from the sensor and affix it to the wall themselves. However, a couple of councils explained that they did not involve residents directly in deployment due to concerns about whether they would know where to put them, and also to make sure residents had informed, positive contact with the council throughout deployment, as opposed to having the sensors forced on them without dialogue:

> "We wanted to do it a bit more personally, deploying them through the housing officers, rather than just posting them or dropping them off. There's a courtesy to explain what we're doing, we're focused on end users... Otherwise they'll go in the bin."
> - Redbridge

Residents were engaged via a number of methods, most commonly phone calls, letters and door knocking by housing officers and surveyors, as well as a couple of councils, including Hillingdon, who integrated engagement in the project with existing visits by asking to install a device to monitor damp and mould during a normal maintenance check.

Camden also deployed the sensors with the family of staff who lived in the borough, due to difficulties getting agreement from other tenants. Barnet used an app to maintain engagement, promote transparency, and involve tenants in the process and subsequent data. Finally, multiple councils utilised existing relationships between specific residents and council staff in order to maximise chances of successful deployment. This included targeting a resident panel that Camden meets with monthly, and residents with prior contact and good relationships with housing officers and surveyors.

> "We took the surveyors who do frontline work and have relationships with them, so they were able to explain what it is, why we're doing it, and how it will help them."
> - Westminster

2.2. Insights: what data and insights did the sensors generate?

As shown in figure 1, sensors capture temperature and humidity data in the home at 1 hour intervals, and use this data to calculate the dew point.

This data is then uploaded by the device to the cloud data platform every 24 hours. Council officers access and monitor this via a data dashboard provided by IoT Solutions Group, which displays the entire dataset collected. The dashboard allows users to select any custom date range for analysis, from one day to over a year.

Councils also receive automated daily alerts for at-risk properties, as well as a weekly report assessing each property's risk of damp and mould. Automated daily alerts are generated when the temperature is either too low (14°C or below for 4+ hours) or too high (26°C or higher for 4+ hours) in a 24 hour period. A 'fuel poverty' alert is generated when the temperature is too low and the property has been tagged as a risk of financial distress.

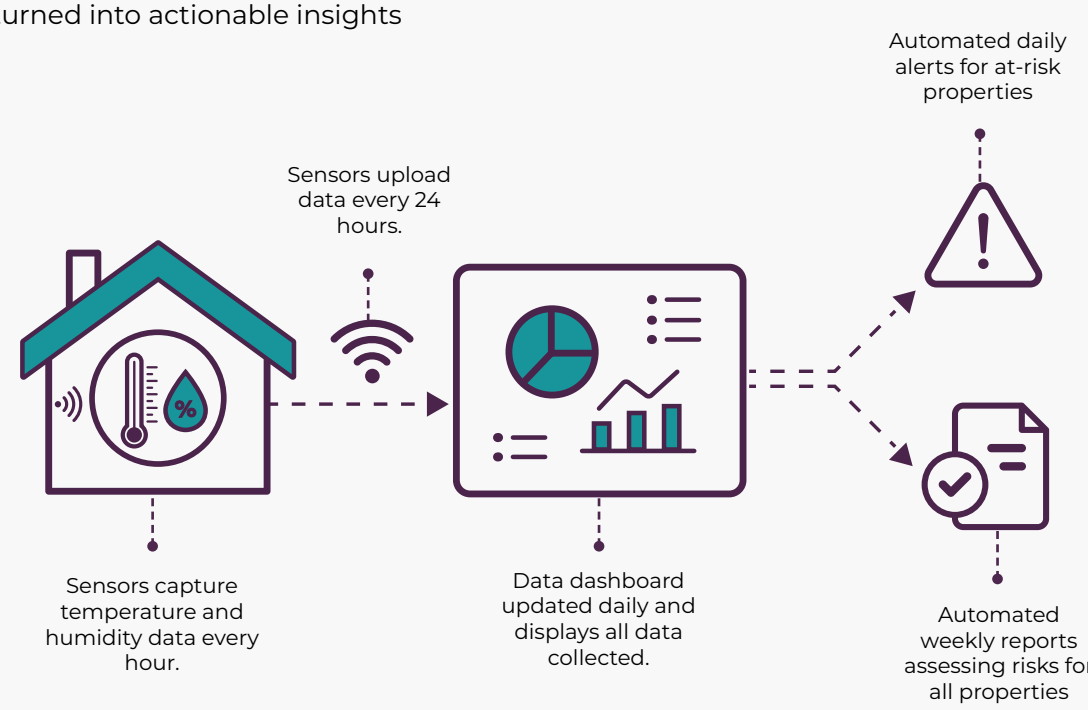
At the start of each week, a weekly report is generated, identifying the most at-risk properties with a RAG (Red, Amber, Green) rating assessing risk levels.

The risk rating is based on the duration a property stays within the parameters set by the algorithm. The report is emailed to assigned officers. We found a large variation in who received alerts and reports, including operational roles such as surveyors and repairs officers, housing service managers, IT/Digital teams, and central customer service teams. Often multiple people or teams received them.

Council officers reported that the dashboard and reports are easy to read, helpfully visualise the data and displays data over time to identify trends and patterns. Together, the insights enabled councils to identify at-risk properties, build up a picture of seasonal risk, as well as looking at fluctuations within the day to give an indication of the cause of the damp risk. For example, high humidity for short intervals during consistent times of the day may indicate lack of ventilation or a low temperature in a property known to have a functioning heating system may indicate fuel poverty.

Some councils have also combined sensor data with other data to generate a more holistic picture, either at the property level or the borough level. For example, Ealing Council combined the data from the environmental sensors from the project with data on the use of appliances such as extractors fans, which shows how often and for how long it has been operated, to generate a fuller picture of the causes of damp and mould in a property.

Figure 1. Schematic diagram of how sensors data is turned into actionable insights



2.3. Use cases: what were sensors used for?

Analysis of interview data reveals both a wide range of uses, as well as one clear dominant use case. For our purposes, a use case is defined as: a scenario of how damp and mould sensors are used to achieve a particular objective or solve a specific problem.

Some councils employed more than one use case, during the project, while others focused solely on one.

We identified the following eight use cases across the project, ranked by frequency:

Use case 1: Proactive and early identification of risk (11/16)

Enabling councils to detect conditions conducive to damp and mould early, allowing for preventative action.

"If we can see the issue before it's arising and treat it as a repair. The resident doesn't have to do anything, they don't have to pick up the phone."
- Hounslow

Use case 2: Damp & mould diagnosis and repair assessment (6/16)

Understanding the causes of damp and mould and why issues persist and ensuring that interventions address underlying problems.

"We used them to understand the tricky cases, where mould keeps coming back. What's going on and whether there are others issues... like fuel poverty"
- Redbridge.

Use case 3: Resident engagement and behaviour change (6/16)

Sensor data used to engage and support residents to adopt behaviours that prevent damp and mould.

"We use the data to communicate with the resident to adjust their behaviours. It's just having that chat and signposting them to the right professionals, housing or cost of living..."
- Hammersmith & Fulham

Use case 4: Predictive maintenance (5/16)

Sensors provide insights to forecast when maintenance or repairs are likely to be needed, and provide evidence to justify retrofits, helping councils plan interventions proactively.

“I would like it to identify properties that need investment. I am hopeful that they don't address it as a single property but an estate issue. If one house is struggling they all should be."
- Waltham Forest

5.

Use case 5: Generating a holistic picture of damp and mould (2/16)

Sensor data use combined with other datasets to identify borough-wide trends and inform strategic decisions.

"We want to start looking at the data more holistically and adding context to it like type of property, age, building fabric, energy rating etc. to get a more insightful picture of the data"
- Barnet.

6.

Use case 6: Evidentiary support for disputes and complaints (2/16)

Provides objective evidence for resolving disputes, defending against legal claims (e.g., disrepair cases), and responding to ombudsman inquiries.

"We were trying to lower the disrepair cases we get... [Sensors] give you the metrics to go back to them and use as evidence."
- Harrow.

7.

Use case 7: Identifying properties at risk of high temperatures (2/16)

During summer months, sensors detect overheating risks in properties, particularly for older residents.

"Hot alerts during extreme weather, prompting welfare calls. When we had the heat wave, we had an alert when it went above 27 degrees in the building. We can contact the residents."
- Hackney.

8.

Use case 8: Assessing suitability of private temporary accommodation (1/16)

Monitoring environmental conditions in private temporary accommodations (TA), where councils have less direct oversight, to ensure they meet safety and wellbeing standards.

"I would like to get them in our paid [TA] properties. I have less trust around those providers. That's where the real value and benefit would be."
- Merton

2/2

We found a clear primary use case, with nearly 70% of councils using sensors to support a more proactive approach to identifying damp and mould issues, often with the explicit aim of preventing serious damp and mould issues.

Three common secondary use cases were also identified across multiple councils:

- **Understanding the root causes of damp and mould (38%).**
- **Engaging residents to adopt behaviours that prevent damp and mould risk (38%).**
- **Predictive maintenance and investment of housing stock (31%).**

Interestingly, the 'understanding causes' and 'behaviour change' use cases often went hand in hand - with four of the six boroughs who employed either use case, employing them together. This is likely because understanding the root causes often required collaboration with tenants to help contextualise the data. Similarly, insights gained from diagnosing the causes of damp and mould also provided the foundation for meaningful tenant engagement. For example, explaining the connection between low ventilation and mould growth allows councils to guide tenants toward specific actions that complement repair interventions.

There also appeared to be a potential link with the predictive maintenance use case and the use case focused on generating a more holistic and strategic data-driven understanding of damp and mould across a borough, with the two councils who employed the latter use case also using the sensors for predictive maintenance.

This makes sense as combining datasets to build up a more comprehensive picture of damp and mould will further inform strategic and targeted decisions about maintenance and investment, enabling a move from case-by-case decision making to more strategic planning.

It should be noted that both of the local authorities that have combined sensors with other datasets were not part of the project itself but rather had already been testing their own set of sensors at a greater scale and for a longer time, indicative of a potentially more mature approach.

The more niche use cases, such as conducting welfare checks on vulnerable residents during heat waves, and assessing the quality of private temporary accommodation, show the wide potential applicability of the environmental sensors and the creativity of councils to use technology to address their particular set of local challenges. We also learned that properties flagging alerts for high temperatures in the summer often correlated to increased damp risk in winter months, helping to build a fuller risk profile of housing stock.

See Annex C for a table showing which use cases were employed by each borough.

3. Benefits to councils' damp and mould process

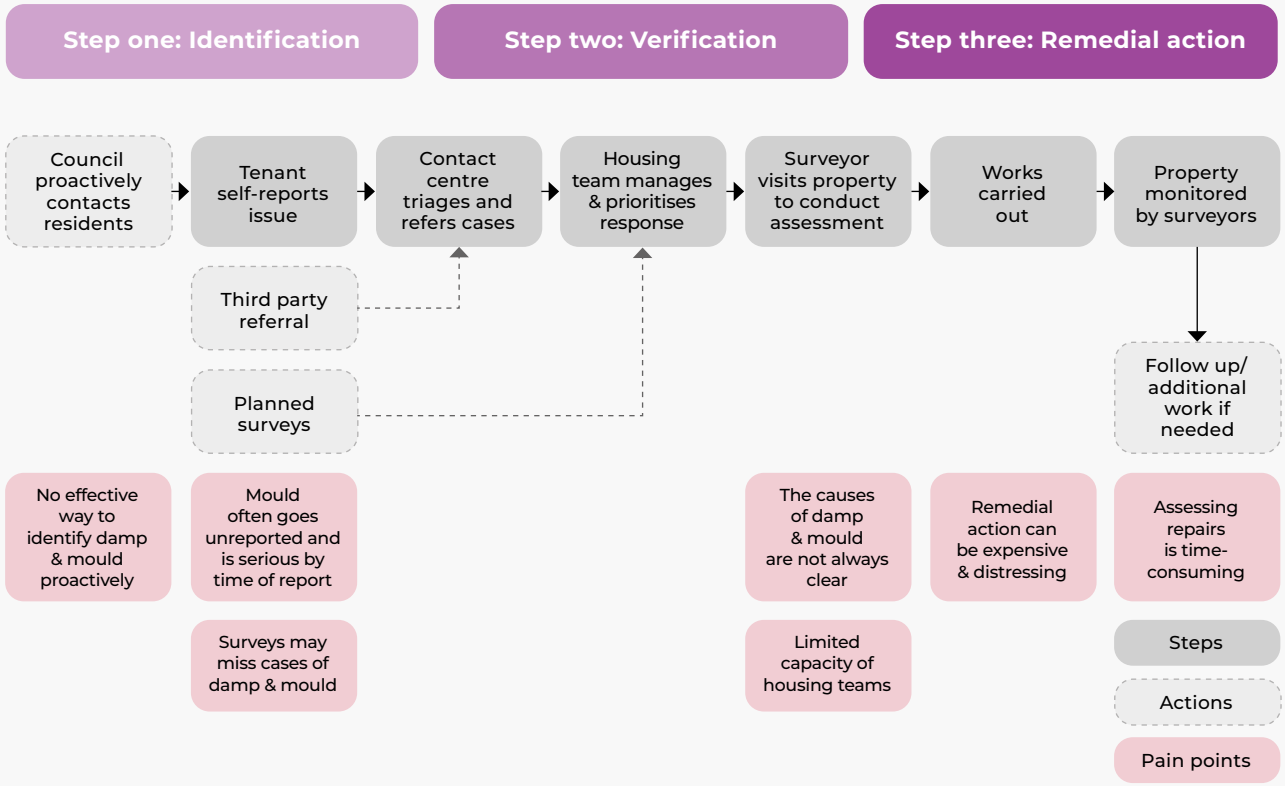
3.1. How councils currently identify and manage damp and mould

We sought to understand and map the existing process used by councils to identify, verify, and treat damp and mould, as shown in figure 2. There is variation between councils and so this should be viewed as a simplified, schematic representation of the process in general.

During interviews with local authorities, a number of pain points within this process were identified where damp and mould sensors may be able to alleviate, including:

- **A lack of an effective means of proactively identifying damp and mould.**
- **A reactive model means mould has often progressed to a serious state or goes unseen.**
- **The cause of damp and mould isn't always clear, inhibiting the effective treatment.**
- **Severe or recurring cases can be extremely costly and distressful.**
- **It can be time-consuming to assess whether the remedial action has been effective.**

Figure 2. Current process of identifying and managing damp and mould



i. Step one: Identification

1.a. Council proactively contact residents

About a third of councils told us they proactively contact residents encouraging them to report any issues. This is done through various channels, such as the local council newspaper or newsletter, direct mail, or a limited number of phone calls (e.g. prioritised based on tenant vulnerability or properties with historical issues with damp and mould).

Pain point: few councils have effective means of proactively identifying damp and mould.

1b. Self-report by tenants

This was the default and primary way of identifying damp and mould for all councils we spoke to. Residents typically report an issue by phone, email or online form to a central customer call centre or dedicated housing repairs contact centre. Most councils collect information from the tenant at this stage to help assess the severity of the problem.

Pain points: damp and mould needs to be visible and serious enough for a tenant to report them, which means that they have often progressed to a serious state. This process also relies on residents to report any issues, meaning councils only see what residents report.

1c. Planned surveys of housing stock

Councils also identified damp and mould through scheduled surveys of their housing stock. Generally, these surveys are not specifically designed to identify damp and mould, but will often pick it up if present. For example, Islington has an agreement with their gas assessment contractor for their operatives to refer any damp and mould issues to the council as and when they spot them.

Pain points: surveys or inspections of this nature, unless specifically looking for damp and mould, may miss cases as not all inspectors are necessarily trained to identify damp and mould risks.

1.d. Third party referral

A small number of councils also reported enabling third party referrals from professionals who have contact with social housing tenants such as GPs, housing officers, temporary accommodation staff, health professionals, and community organisations. Where these arrangements exist, these typically make up a very small proportion of all cases.

ii. Step two: Assessment and verification

2a. Council triages cases

Once a tenant formally reports an issue, the case is triaged and given a prioritisation based on severity. This is typically done by a central team, such as a customer service centre or housing contact centre. The case is then referred to an internal repairs and maintenance team or a specialist damp and mould team, or directly to an external third party contractor.

2b. Council sends an officer to conduct assessment

A housing officer or surveyor visits the property within a certain time period to conduct an inspection. This assessment is generally carried out by an in-house team of surveyors but occasionally a council will have a contract with a 3rd party to conduct an assessment.

Pain point: surveys have significant costs and many housing teams have limited surveyor capacity. Additionally, while the underlying cause of damp and mould is sometimes clear, often it is not, leaving officers to treat the issue without a clear idea of what caused the problem.

iii. Step three: Remedial action

3a. Repairs work carried out

If damp and mould is present, repairs or remedial action are carried out. Various repairs and maintenance delivery models were reported, ranging from in-house teams, to third party or council-owned companies, to an approved network of contractors.

A mould wash is typically the first option, followed by an anti-microbial paint treatment. Depending on the severity and cause of the case, it may warrant additional or more extensive maintenance or repairs to be carried out such as fitting a new extractor fan, fixing a leak, mending a boiler. In severe cases, a tenant will have to be temporarily 'decanted' or re-housed while more extensive repairs are conducted.

Pain points: remedial actions such as mould washes can lead to high costs, while severe cases can be extremely costly for the council and distressful for residents.

3b. Property monitored to assess effectiveness of damp and mould interventions

Properties with known damp and mould issues are monitored post-intervention for effectiveness. Monitoring includes resident check-ins and/or physical inspections between a 6–24 week period, usually during winter months, with annual checks for recurring issues.

In some cases, additional actions may be necessary, with several councils reporting properties known to have recurring mould that need to be treated multiple times a year.

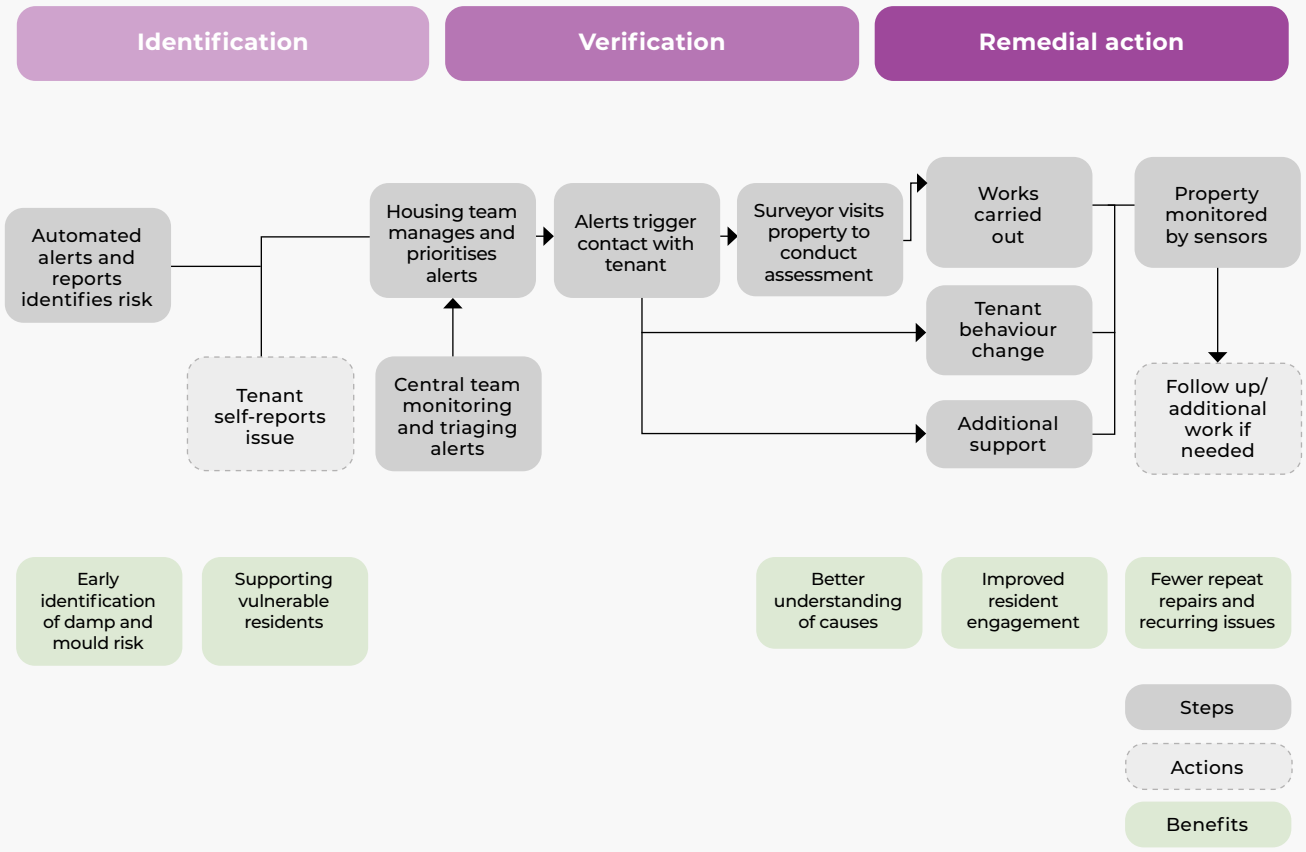
Pain point: officer time is needed to conduct repeat visits to assess whether remedial action has been effective. Properties with recurring issues require significant resources to manage.

3.2. Benefits to how councils identify and manage damp and mould

Due to the limited scale and duration of the project, the majority of councils said it was too early to understand whether there had been significant impacts on outcomes like reduced damp and mould within the borough, reduced complaints, or improved resident health.

However, councils did highlight a series of benefits that indicate a number of improvements to the process of identifying and managing damp and mould, as illustrated in figure 3.

Figure 3. Simplified sensor-enabled process for identifying and addressing damp and mould



i. Enabling quick action through earlier identification

The most commonly reported benefit of the damp and mould sensors was that they enabled councils to proactively identify, often for the first time, properties that were at high risk of damp and mould much earlier, allowing them to take action before issues have escalated.

Council officers reported being able to take action more quickly as a result, leading to either preventing or dealing with issues sooner and reducing the likelihood of more serious (and costly) issues from developing, leading to expensive repairs or tenant relocations.

> "Taking earlier action to prevent issues getting worse. Preventing the issues getting worse where it would cost more money because it would cause major works and the tenant would have to move out."
> - Hammersmith & Fulham.

This enabled councils to shift from a reactive service model, reliant on residents reporting issues, to be much more proactive in monitoring risks, proactively engaging residents, and if needed, visiting properties and carrying out repairs.

> "We're completely redesigning the service... moving from a reactive approach to a proactive approach."
> - Redbridge.

ii. Better support for vulnerable residents

Early identification of risk and the ability to act proactively was also reported as enabling councils to better support vulnerable residents.

As discussed, one consequence of councils' reliance on resident self-report is that many cases of damp and mould can go unseen and unaddressed. One council officer expressed concern that this is most likely to be the case for tenants who are particularly vulnerable.

> "It's helped us be more proactive. There is an ethical thing here. If you look at the people who report things to the council, is that representative of the overall tenant mix? This is identifying the problem without vulnerable residents having to report it."
> - Westminster.

Sensors also helped highlight fuel poverty. Accounts from local authorities revealed high levels of fuel poverty, which repairs and maintenance teams were often unable to address.

> "We're starting to identify people in properties at risk of fuel poverty... It's helped us in some cases where there might be a fuel poverty issue. We've made referrals to the specific team in the council that can help them in that way."
> - Islington.

Several councils even reported that the insights helped them to adopt a more holistic approach to supporting the tenant.

> "It needs to be more of a holistic approach to the problem, not just a repairs mindset, or behaviour mindset, but financial and whole council approach to tackling the problem. It's not just a damp and mould issue, the alerts show other repairs might be needed, or that there are financial challenges. We're finding the alerts showing these different issues. So [our response] is not just limited to the housing team, it includes financial support, employment support team, and lots of other teams that can play to support residents."
> - Westminster.

iii. Addressing underlying causes of damp and mould

Sensors helped pinpoint the underlying causes of damp and mould, especially in properties with recurring issues.

By providing consistent and accurate data on risk factors, sensors were able to provide an indication of what is likely causing the issue. These insights often needed to be combined either with data from additional sensors (such as Ealing using sensors in extractors fans) or engagement with residents to understand what's behind the data.

> "There's been one or two cases where surveyors have gone out and have noticed it's a recurring issue, we've used that data to identify the problem. We've installed a fan on one property and haven't had a call for the longest time at that property so far."
> - Islington

Having a better understanding of the problem enabled councils to ensure that repairs addressed the specific underlying issues, leading to more effective interventions, as well as opening up a wider range of potential options. For instance, there are multiple possible reasons why a property might be showing a low temperature reading - such as a faulty heating system, patterns of tenant occupation, or fuel poverty - each of which requires a different approach to address the risk.

> "It's about understanding what the data is telling us and what's causing the damp and mould risk and therefore what the solution needs to be, whether it's behaviour change, property specific or fuel poverty related."
> - Barnet.

iv. More efficient use of housing officer time

Sensors led to tangible process efficiencies, such as reducing unnecessary visits and minimising repeat repairs.

For instance, councils reported fewer call outs to properties, suggesting that sensors can reduce the need for inspections by enabling remote monitoring.

> "We do have repeat visits where we have to deal with mould but they are fewer and farther between. Recently, we've noticed we are not doing as many visits where we've got sensors installed."
> - Ealing

By enabling councils to monitor the effect of any remedial action remotely, the workload for housing officers is reduced, allowing teams to focus on properties with the greatest need. Additionally, by addressing the causes of damp and mould more effectively, councils have reported fewer follow up and repeat visits to properties.

In the longer-term, several housing officers told us they expected this to help them prioritise and target which properties they inspect and carry out maintenance on, enabling more efficient use of scarce officer time.

> "We call and check to see if there are still issues, which is a waste of time and the sensors saves time in that respect. It has helped in the sense that we don't have to frequently go out to properties or have to call [residents] as much."
> - Hillingdon.

v. Improved resident engagement

The use of damp and mould sensors has significantly enhanced how councils engage with residents.

For example, councils reported that the insights from sensors have opened up new types of conversations with residents, creating opportunities to build trust and relationships.

> "We check data and see what's going on, contact residents and have a conversation... [it] helps build relationships with tenants. Sensors mean we're taking it seriously."
> - Islington

The trust built through proactive communication also makes residents more comfortable sharing personal challenges, such as struggles with heating costs. One officer noted:

> "Some people just don't want to say they don't have enough money to pay for heating because they might be embarrassed. That happened and it was really nice to be able to signpost to the cost of living team and do that differently."
> - Hammersmith & Fulham

The data collected from sensors has also led to observable changes in resident behaviour. Councils have found that sharing insights helps residents understand how their actions, such as ventilating their homes or maintaining consistent heating, impact damp and mould. For example, Hounslow Council reported that, as a result of using alerts and sensor insights to engage residents in a more targeted and effective way, alerts flagging damp and mould risks were reduced in half of the properties.

A number of councils emphasised the importance of engaging tenants as partners rather than blaming them. This is particularly important given concerns about privacy that some residents expressed.

Many councils shared data insights directly with residents, providing greater transparency as well as enabling tailored advice, such as tips on ventilation or heating. One example is Barnet's Resident App, which has been installed by each of the 300 residents in their project. The App allows residents to interact with sensors, receiving alerts about temperature or humidity along with actionable advice about what to do if they get an alert, which, as their Programme Manager noted, helps to "reduce anxiety with residents in a big way". The App also has functionality to allow them to take photos and report mould.

> "We didn't just want to deploy sensors in people's homes and collect data on them like Big Brother. We really wanted residents to be part of it both in terms of buy-in and trust and transparency but also to instil behaviour change."
> - Barnet

vi. Financial savings from addressing damp and mould

Councils anticipate significant cost savings from the use of damp and mould sensors, though it is still too early in the project phase to fully quantify these savings.

> "We also think there will be lower cost, because we spend an absolute ton on damp and mould reactively."
> - Camden.

Several councils have worked with their finance teams or external organisations to develop early financial estimates for cost savings based on the insights sensors provide if deployed at scale. Based on these initial cost benefit analyses, initial estimated savings of up to £8 million per year have been calculated. However, these estimates are highly context dependent and should be calculated on a case by case basis.

> "We can deliver significant cost savings in how we deal with the damp and mould problem by deploying sensors and embedding this in our processes."
> - Barnet.

For example, some early business case analysis has estimated a potential annual savings of up to £135 per property as a result installing sensors at scale and enabling more proactive damp and mould interventions.

Councils reported that the expected savings largely result from several key areas:

- Preventing severe cases: Sensors enable proactive interventions, preventing the escalation of issues that lead to severe damp and mould cases. These cases often require costly repairs, extensive remedial action, or even tenant relocations.
- Reducing visits to properties: Remote monitoring of risks reduces the need for repeat visits by housing officers to monitor and assess repairs. This saves staff time and allows resources to be reallocated to other priorities.
- Fewer recurring issues: By addressing the root causes of damp and mould more effectively, councils can reduce the frequency of recurring cases, saving time and resources by eliminating the need for repeat repairs.
- Efficient and targeted inspections: sensor data enables a more targeted inspection regime. Councils can prioritise at-risk properties for proactive inspections, optimising the use of inspection resources.
- Reduced legal expenses: Improved management of damp and mould reduces the risk of legal claims and compensation payouts, leading to further financial savings.

4. Challenges to deploying and using sensors

4.1. Interpreting and acting on data

i. Unclear processes to translate insights into action

There was a wide variation in how councils interpreted and acted upon alerts and insights. Officers spoke of a lack of clarity about what alerts and risk ratings meant in practice, which made it harder to know how to respond. Some councils sent a surveyor out for every amber alert, while other councils responded to a red alert with an initial call to a resident. This led to some councils reporting 'false alarms', where sensors flagging issues like high humidity or low temperatures that did not indicate actual damp or mould problems. This led to unnecessary inspections, wasted staff time, and frustration among council staff responding to the alerts, who found no actionable issues upon investigation.

> "About 90% of the time, when we've gone to red alerts, the inspector has gone to the property and found no visible evidence of damp and mould. Inspectors were getting disillusioned because it wasn't working. So we have had to look at how we manage alerts going forward, we really need to nail down how we react to these."
> - Barnet

This underscores an important feature of the sensors: they generate data about risk, not directly about damp and mould. It was clear that not every alert required immediate action or a call out. This presented challenges to services that have typically been designed to respond to issues, rather than pre-emptively based on risk profiles of properties across housing stock. Actions should be proportionate to the risk and treated as an early warning system allowing for faster, more proactive and preventative measures. There is a risk that, without clear definitions, thresholds for action and defined workflows, sensors at scale could overwhelm a service - potentially leading to a higher workload for operational staff due to having to respond to unnecessary red flags.

See Annex D for an example of a process map from Westminster that sets out the teams and actions suggested for each type of alert.

> "It's all a bit all over the place at the moment. The alerts are getting sent to everyone and their uncle at the moment. So finalising implementation of a process"
> - Harrow.

Some councils also shared that it was difficult to shift operational processes with only 10 sensors deployed across their boroughs, as the scale is too small. As such, a larger scale project, taking learning from this initial trial project, may also help boroughs better integrate insights into their existing workflows and customer pathways.

ii. Sensors only generated a partial picture

Another issue that some councils reported was that the sensors only provided a partial picture, but lacked data on other critical factors like boiler usage or ventilation. This incomplete picture made it more difficult to pinpoint specific causes of damp and mould. Teams struggled to make informed decisions, often relying on assumptions about residents behavior or property conditions.

> "The sensors are one piece of the puzzle, but if we had sensors on the boiler and the fans, we'd know the full picture of the property and why it's occurring."
> - Hillingdon

4.2. Operational Challenges

i. Lack of operational capacity

Challenges with operational capacity, coordination and time constraints affected the ability to deliver the project effectively. For example, housing teams, surveyors, and other operational staff were already stretched thin by their day-to-day responsibilities, leaving little capacity to support the project. We heard multiple accounts of how balancing delivery alongside existing workloads proved difficult.

> "If you leave it with the operational teams... they're going to struggle and just feel overwhelmed and exhausted by it and think how is this helping me."
> - Barnet

A consequence of this is that critical tasks like responding to alerts or engaging residents were deprioritised, and staff became frustrated by the additional demands on their time. Teams often struggled to find the time to deploy sensors, which left little room for strategic planning and selective placement of the sensors. We heard from some councils that because of capacity and internal communication issues, the project felt rushed and put extra pressure on already stretched council staff.

> " I wasn't even aware I was supposed to ring them. Residents won't answer the phone and I have limited availability. At the moment all my staff are overworked. The infrastructure needs to be better not just for us but for all councils."
> - Waltham Forest

We also heard that a skills deficit and lack of capacity to engage in training amongst council staff deploying the sensors impacted both deployment of sensor and ongoing delivery.

> "Some staff had some issues at the beginning with how to get the things set up and getting the [sensors] working and linked in. - Ealing

ii. Lack of clarity around roles and responsibilities

A number of councils also reported not having the right roles, such as programme coordination or data analytics, to deliver the project.

In the absence of these roles, delivery often fell to operational staff such as housing officers and surveyors, who needed to be involved but were often not the right people to be leading the project.

> "Surveyors were not happy at first. They'd rather be putting people's properties right, they want to get people's houses fixed."
> - Waltham Forest

Teams also struggled with unclear roles and responsibilities, particularly during the setup phase, and multiple project owners. Without clear roles and accountability, as well as support from senior leadership, there was confusion over who should lead the project, manage deployments, or handle operational challenges. We heard how this lack of clarity delayed progress, with key activities falling through the cracks or requiring extra capacity to resolve.

iii. Gaps in data protection approaches caused delays

Some councils initially had difficulties with their alerts and analysis due to the method employed for data minimisation. Instead of inputting personal data about tenants, such as names or addresses, data was pseudonymised by giving each property a reference number in the system. This was done with the hope of avoiding what some project teams felt might be delays from data protection compliance. However, this meant that some users of the system were unable to immediately view specific addresses for alerts. Additionally, gaps in data protection work to identify lawful basis conditions meant some councils were unclear on what data they could process for what purpose, and were unable to analyse data sufficiently - although it was data they already held.

Over time, the issues councils faced were resolved, but this underscores the importance of getting the information governance framework right at the beginning of every project, as well as supporting both information governance leads and project officers to understand the legal and technical processes at play.

Without the external support and advice from both LOTI and IoTSG (IoT Solutions Group), such as an information governance guide from LOTI, it is likely that this challenge would have presented a more significant barrier to delivery.

> "At first it was very arduous having to do a DPIA, but we're now very grateful, we are the holders of data, but we have to be very careful. " - Hounslow

4.3. Systemic issues and unactionable insights

i. Fuel poverty is a major driver of damp and mould risk

The project highlighted broader challenges that required structural solutions that could not be easily addressed within the scope of the project and required significant cross-departmental, holistic support and/or long-term investment. One major such issue was fuel poverty. Many residents couldn't afford to turn their heating on, leading to persistently cold and damp homes, with residents forced to live in very cold conditions. Multiple reports from councils suggest a high prevalence of fuel poverty associated with damp and mould cases.

> "70% of damp and mould issues, we go in, and it's fuel poverty. The temperature of the property is well below the norm."
> - Ealing.

Councils expressed concern that the sensors are unable to help with fuel poverty, and some were frustrated at being asked to speak to residents about changing their behaviour under these circumstances.

> "What am I supposed to say when someone says I can't put my heating on? When someone says I'm having to choose between heating or putting food on my table?"
> - Waltham Forest

Whilst a couple of councils mentioned referrals to fuel poverty and energy advice services such as the **SHINE network**, many were unclear on signposting and support options for these residents, and felt there weren't enough options to address fuel poverty.

> "We went to a property yesterday and the family was sitting there in the afternoon in a property that was stone cold, colder inside than out, complaining about mould. So how do we address that? That's the issue we have."
> - Ealing

ii. Poor insulation and aging stock contribute to risk factors

Under-investment in housing stock was another systemic issue that can increase the risk of damp and mould but requires solutions outside the scope of the project. Councils reported that many of their properties were old and no longer fit for purpose. For example, many were not designed for multiple occupants and bathrooms, which creates more moisture than buildings can cope with, making damp and mould difficult to manage regardless of resident behaviour.

> "These are older buildings from the 50s and 60s... The plan is to replace them."
> - Hackney

We were told that buildings were also often poorly insulated or structurally flawed, which required long-term regeneration plans and investment to address these issues.

> "The general consensus from our surveyors is that most of the tricky issues are because people can't afford the heating and insulation is often not as good as it could and should be and we're now trying to retrofit that. For the vast majority, it is the common factor."
> - Ealing

We also heard from surveyors that they found it difficult to engage residents' to change behaviour when features of the housing stock exacerbate the risk for damp and mould.

> "My role as a surveyor is to make sure a building is defect free. The building has to be defect free before it becomes a behavioural issue."
> - Waltham Forest

4.4. Resident Engagement and Access Issues

i. Unwillingness to engage with council

Gaining access to residents' homes for sensor installation proved challenging, as many residents were reluctant to engage, hard to contact, or unavailable.

> "It's been hard to get the damp and mould sensors in... Some people just don't want to engage with the council, the response is 'leave me alone', people say they don't know when they're going to be home, just not playing ball."
> - Hackney

We heard that residents often had poor or non-existent relationships with the council, sometimes due to associations with staff such as housing officers who they have previously encountered negatively in their roles, which impacted their willingness to get involved.

> "It's very intrusive, the housing officer would be told to get lost. A lot of the time our residents are only experiencing our Housing Officers in forceful roles, noise complaints, complaints about the condition of their garden. I've no doubt they aspire to be more customer focused."
> - Barking & Dagenham

This slowed sensor deployment and required significant effort to secure participation, including repeated and varied outreach approaches, such as letters, door knocks and tailoring methods of contact to specific residents, anticipating questions residents might ask, and preparing introductory information to the project.

> "Instead of rushing into it, we thought about all the different things a resident might ask, we thought about consent... about residents who might not respond to just a letter, we followed up with door knocks which was really key. It meant there was a face to this, conversations could happen face to face. The letter we sent had an FAQ, an intro to the project."
> - Hounslow

ii. Concerns about privacy

Councils reported a mixed response from residents to the sensors. Many viewed the sensors as invasive, perceiving them as monitoring devices that collected private information that could be used to spy on them. This was commonly cited and a primary objection residents gave to having a sensor in their homes. Council staff had to spend considerable time reassuring tenants and addressing misconceptions, which added complexity to the rollout.

> "The Big Brother challenge and the conspiracy around it and people thinking the sensors can spy on... we just had to educate and reassure and say no it can't spy on you."
> - Harrow

4.5. Project design and limitations

i. Scale and duration of the project

The limited scale (10 sensors per borough) and duration (approximately 9 months), limited the amount and type of evidence boroughs were able to generate to support business cases for expansion. As discussed, most councils we spoke with said that it was hard for them to assess the impact of the project on key outcomes such as the number of damp and mould repairs, disrepairs legal cases, or costs associated with damp and mould.

> "We can't change the process until you've got a critical number of devices. We need to do that business case, we need to weigh up the costs and benefits"
> - Hounslow

ii. The project didn't cover the winter months

Due to delays to the start of the project, delivery largely took place during the warmer months, from around April to December, when damp and mould issues were much less prevalent. This meant councils struggled to make relevant inferences in the timeframe or test the sensors during peak damp and mould conditions.

> "From May to September, there was no activity because it was summer. So we're only looking at 2 months of data, making full judgements with 2 months of data is really hard. The project should have been done starting in August through autumn and winter." - Hillingdon

iii. More opportunities for knowledge sharing

Some councils wanted more opportunities to learn from one another's experiences and adapt or progress the case for the sensors based on shared data and successes, especially from councils who had been able to deploy more sensors.

> "What would be useful for my business case would be data from boroughs who've deployed more. We're at the bottom end because we've only got 10. Are there leading boroughs? We could visit them, have a conversation, expand the network?"
> - Barking & Dagenham

5. Recommendations for the future use of sensors

5.1. Most promising use cases for replication and scale

i. Proactive and early identification of damp and mould risk

Sensors enable councils, for the first time, to identify properties that are most at risk of damp and mould, at scale and in a cost-effective way. By acting as an early warning system, councils can use sensor insights to intervene before these risks escalate into severe problems requiring extensive repairs or tenant relocations.

The ability to act early is a potential game-changer for housing teams, as it allows them to take preventative action to avoid the cascade of problems that often result from undetected damp and mould. These issues can escalate quickly, damaging the property, increasing repair costs, and significantly impacting tenant health and wellbeing. Proactive identification also aligns with recent legislative changes that require councils to address damp and mould more effectively. By identifying risks early, councils can demonstrate compliance with these regulations while improving service delivery.

This use case also offers significant potential for scale. Once the initial investment in sensors and monitoring systems is made, councils can extend the approach across their entire housing stock. The cost of scaling is relatively low compared to the early indications of potential savings. Early identification also provides actionable data that councils can use to optimise resource allocation, prioritising interventions for properties at the highest risk.

ii. Damp and mould diagnosis and repair assessment

Sensors can also be used to identify the root causes of damp and mould and then evaluate the effectiveness of interventions. Sensors provide detailed environmental data which can help diagnose underlying issues, such as poor insulation, faulty heating systems, fuel poverty, or tenant behaviour. Post-repair monitoring ensures that interventions address the root causes effectively and prevents recurring problems. Without understanding the causes of damp and mould, councils risk investing in repairs that address only the symptoms rather than the root causes, leading to expensive recurring issues and tenant dissatisfaction.

The scalability of this use case lies in its adaptability. Councils can start with properties that have known damp and mould issues and gradually expand the approach across their housing stock. As more data is collected, councils can refine their diagnostic and repair strategies, creating a more efficient and effective system for managing damp and mould.

Notably, during the project, there was a strong correlation between this use case and the ‘resident engagement’ use case (see below), as understanding root causes often required collaboration with tenants to contextualise the data. This highlights the potential to layer use cases, where in this instance, diagnosing issues serves as a starting point for engaging residents and tailoring solutions to their specific circumstances. As such, councils should consider adopting both to make each use case more impactful when implemented together.

iii. Resident engagement and behaviour change

This use case addresses one of the most important aspects of managing damp and mould: tenant engagement. Tenants may not fully understand how their behaviour, such as drying clothes indoors without ventilation or intermittent heating, can increase the risk of damp and mould developing. Councils have used sensor data to facilitate engagement with tenants in a constructive and collaborative way. This is particularly the case where councils have integrated their response into existing customer support pathways, which can help shift the focus from blame to collaboration by taking a more holistic approach. This approach can also build trust between tenants and housing teams, making it easier to implement solutions.

Some councils have taken this approach a step further by sharing data in real-time with residents and making it easy to access and understand the insights. For example, Barnet's Resident App provides all residents with direct access to their sensor data, sends notifications to residents when risks are high, and provides simple tips to help reduce damp and mould risks. Approaches such as these are key to facilitating tenant engagement at scale.

As noted, this use case is strengthened by the Diagnosis and Repair Assessment use case above. Insights gained from diagnosing the root causes of damp and mould provide the foundation for meaningful tenant engagement. For example, explaining the connection between low ventilation and mould growth allows councils to guide tenants toward specific actions that complement repair interventions.

iv. Predictive maintenance

Sensors provide data that councils can use to predict when maintenance or repairs will be needed. This enables a planned and cost-effective approach to maintaining housing stock, reducing the need for reactive repairs and minimising service disruption for tenants. Predictive maintenance represents a significant shift in how councils manage their housing stock. Current maintenance models often rely on reacting to tenant-reported issues or scheduled inspections. With sensors providing real-time data, councils can proactively target interventions that address problems before they escalate.

To maximise the potential of predictive maintenance approaches, councils should consider integrating sensor data with complementary datasets, creating a comprehensive view of property conditions. This holistic picture provides the foundation for scaling predictive maintenance efforts as the aggregated data helps identify which housing stock is most in need of future maintenance, enabling a more proactive approach. Over time, data can be used to refine predictive models, making the system increasingly accurate and efficient. This use case requires specialist data analytics support to integrate datasets, generate borough- wide insights, and identify trends and hotspots to inform predictive maintenance strategies.

5.2. Recommended actions and next steps

i. Building the evidence base and business case for scaling sensors

To support the wider adoption and effective use of damp and mould sensors across London, LOTI, GLA and London boroughs should prioritise the development of a robust, evidence-based business case demonstrating clear financial, operational, and social returns.

a) Extend the project through the winter months

- The GLA, with help from LOTI, could continue to support councils through the winter and conduct a further round of data collection to understand impact during winter, the peak season for damp and mould issues. This critical period provides valuable insights into sensor performance and potential process improvements.

b) Expand the project to test at scale

- Future opportunities could be explored to scale up projects to include a larger number of sensors (e.g. 100+), enabling councils to operationalise process changes and ensure representation across different property types
  This could include:
  - Trialling process changes before wider roll-out and generating evidence to support the business case.
  - Test using multiple sensors per property to improve risk profile of properties.
  - Explore additional sensor types, such as appliance dataloggers, to build a more comprehensive understanding of damp and mould causes.

c) Develop a London-wide business case framework

- LOTI could establish a shared business case framework that boroughs can adapt to their specific contexts. This framework should include:
  - Templates for calculating costs, benefits, and return on investment (ROI).
  - Case studies and data from leading boroughs that have scaled effectively.
  - Tools for estimating savings, such as reduced repair costs, fewer legal claims, and improved resident health outcomes.
- Councils could share work from cost benefit analyses and business cases development to support the production of pan-London resources.

d) Facilitate learning and evidence sharing across boroughs

- Continue to facilitate collaboration between boroughs to share learning, data, and experiences. This could involve a central evidence repository, shared information governance resources, or regular cross-borough workshops.
- For example, LOTI should facilitate a learning workshop in the spring to share post-winter learning.

ii. Strengthening resident engagement through sensor data

Councils could use damp and mould sensors not only as a tool for monitoring but also as a way to foster meaningful engagement with tenants. By sharing insights transparently and supporting residents with tailored advice, councils can create a partnership approach that empowers residents to take preventative actions without shifting blame.

a) Secure resident consent during installation to build trust

- For existing tenancies, councils could ensure residents are fully informed and give their consent before sensors are installed. Transparent communication about the purpose and benefits of the sensors helps alleviate concerns about privacy.
- For new tenancies, councils could consider using an 'opt-out' model, where sensors are installed as the default, but tenants have the option to say no if they wish.

b) Ensure tenants have access to sensor data to increase transparency

- Councils could ensure tenants have access to sensor data and insights, building on examples such as Barnet's Resident App.

c) Develop and test communication strategies that encourage behaviour change

- Councils could use insights to experiment with different methods of communication (e.g., friendly nudges, educational messages) to encourage residents to take small actions that reduce damp and mould risks.
- Councils could ensure messages avoid blame and instead foster collaboration - for example, framing nudges as helpful reminders rather than directives or criticisms.

d) Co-design engagement tools and processes with residents

- Councils could explore co-designing engagement tools with residents to ensure communication is accessible and effective.
- LOTI could support councils to gather feedback directly from a sample of residents involved in the project to understand residents' experience and inform next steps.

iii. Establishing processes for responding to sensor data

Embedding insights into operational processes has proved difficult for most participating boroughs, with only a few examples, such as Barnet, Greenwich, and Hounslow, all of which have been deploying sensors at a larger scale. To maximise the benefits of damp and mould sensors, councils could develop clear strategies and processes for using the data effectively. This includes defining a vision for how sensors will support housing operations, clearly defining roles and ensuring alignment with existing workflows. Without these foundations, councils risk being overwhelmed by alerts or failing to act on insights appropriately.

a) Define a clear strategy and vision for using sensor data

- Councils could establish a clear IoT data strategy, based on one or more of the recommended use cases that:
  - Articulates the purpose of sensor deployment and intended outcomes;
  - Sets out how sensor data will be used to achieve these outcomes; and,
  - Defines what operational changes are needed to capture benefits.
  - Aligns with the principles set out in the **London IoT Declaration**.

b) Integrate sensors into existing workflows and customer pathways

- Councils could clearly define roles and responsibilities, including which teams install sensors, monitor alerts, analyse data for wider trends, etc.
- To do this, LOTI could support councils to undertake service design processes to map their existing processes and pathways and develop service blueprints that can be adopted and adapted by other councils.
- In doing so, councils could ensure that sensor data is integrated into current operational processes to reduce workload on stretched operational roles and enable a more holistic, resident-focused approach.
- For instance, alerts could flow through existing customer service pathways for triage and action - ideally the same teams that respond to resident self-reports of damp and mould - where they can signpost to the most appropriate support.

c) Develop standardised best practice for managing and responding to insights

- LOTI could support the development of standardised practices for managing and responding to insights and alerts. This should include:
  - Establishing clear thresholds for action, based on a clear understanding of the level of risk or presence of additional risk factors (e.g. building age or type);
  - Setting out clearly defined actions for when those thresholds are met that are proportionate to the risk.
  - Develop and share data protection documentation and resources councils can use to engage and reassure tenants about sensors and how the data will be used.

iv. Bringing in the right roles and capacity to scale

To ensure the successful deployment and scaling of damp and mould sensors, councils must address resourcing and capacity challenges by investing in dedicated roles, robust governance structures, and training for operational staff.

a) Invest in effective programme management to coordinate delivery

- Councils could include in their business cases a dedicated, non-operational programme manager and/or team that can coordinate the roll-out, help define and integrate clear processes, and bring the right teams together.
- Councils could create a Steering Committee or similar governance arrangement to bring together key stakeholders, including housing teams, customer service, IT/digital, and data specialists. This will streamline decision-making, set priorities, and ensure alignment across departments.

b) Allocate dedicated resources for data management and analysis

- Councils could work with their insight and intelligence teams to manage, analyse and integrate the data with other datasets to enable borough-wide analysis that supports strategic decision making and predictive maintenance planning.

c) Further automate monitoring and reporting, where possible

- Use automation to reduce manual workloads by creating systems that flag alerts based on predefined thresholds that trigger action. This may include an initial automatically generated notification to residents with tailored advice.

d) Provide training and clear guidance to frontline employees

- Develop training programs for staff managing sensor data to ensure they understand how to use dashboards, interpret alerts, and prioritise actions effectively.
- Create simple, user-friendly setup guides for teams managing initial deployments to minimise technical barriers and support engagement with tenants to explain the devices and how data will be used.

Annex A: Evaluation framework

1. Introduction

i. Proactive and early identification of damp and mould risk

This document sets out a framework for evaluating the Damp and Mould Sensor Project. The Greater London Authority (GLA) and LOTI (London Office of Technology and Innovation) are collaborating to enable the rapid deployment of IoT sensor technology to improve the quality of London's housing stock. The Damp and Mould Project involved providing 18 boroughs with 10 sensors each, who were then free to deploy the sensors as they choose within their housing stock.

During the project kick-off, three potential expected use cases were identified, although there may be more. These include:

- Identifying and verifying damp/mould issues,
- Assessing the effectiveness of repairs,
- Providing evidence to justify retrofits.

LOTI has identified a number of potential benefits of the IoT Damp and Mould Project:

- Identify root cause of damp / mould issues
- Understand scale of problem in boroughs and across London
- Give confidence that improvements and remediations are working in properties
- Capture evidence for claims / discussions
- Identify problems before they happen
- Proactively mitigate reputation damage

The purpose of this evaluation is to evaluate the deployment, effectiveness, and impact of IoT damp and mould sensors across the participating London councils. Specifically, the evaluation aims to:

- To understand how boroughs have deployed and used damp and mould sensors.
- Generate evidence and actionable lessons of what worked and what didn't.
- Identify the most promising and impactful use cases for replication and scale.

2. Key learning themes and questions

1. Deployment and use cases

a. How did boroughs deploy the sensors?

b. What use cases were selected? What is the value proposition of each use case?

c. How were internal stakeholders (housing, data teams) and residents engaged in the deployment and use of sensors?

d. What challenges or barriers to implementation were faced?

2. Impact of sensors

a. What insights have the sensors generated and how have they been used?

b. What current processes exist for managing damp and mould issues, and how have they changed as a result of the sensors?

c. Which process changes have been most effective in improving operations?

d. Have any cost savings or other quantifiable benefits been realised?

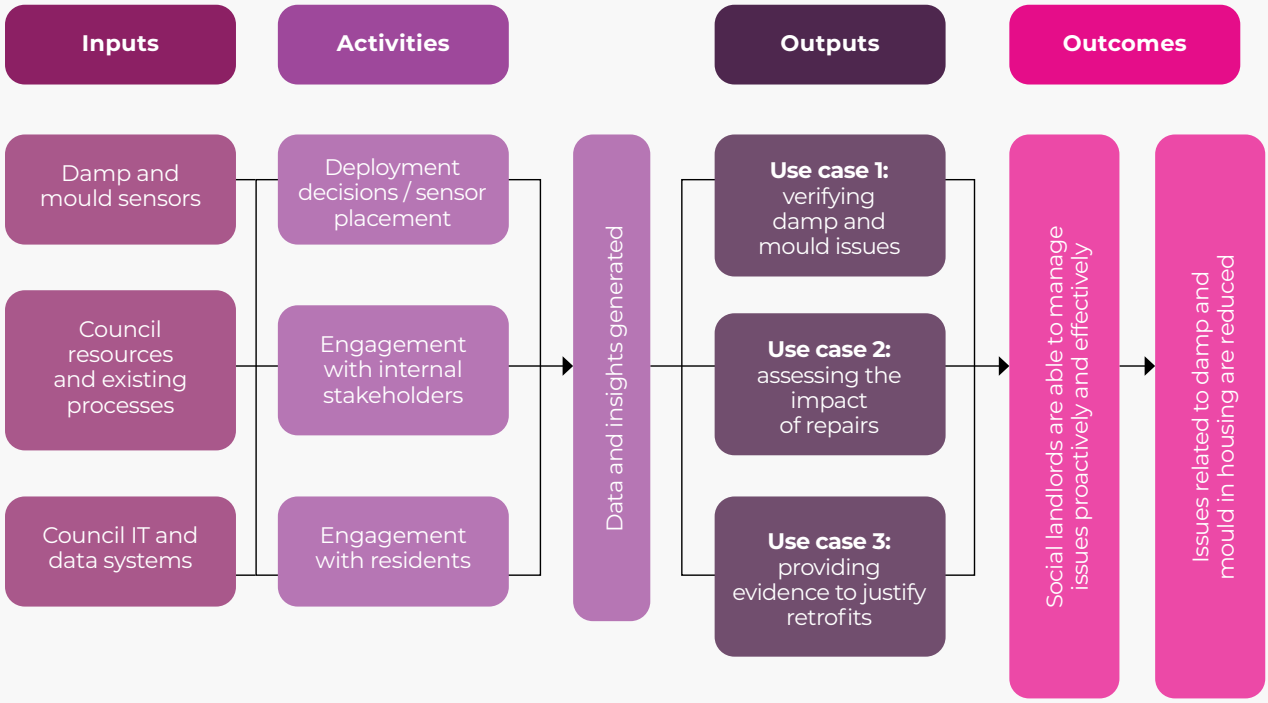
3. Scaling what worked

a. Which use cases were most effective and could be replicated across boroughs?

b. What people or processes are needed to deliver value at scale? What additional support do councils need?

3. Damp and Mould Sensor Logic model

Figure 1. Logic model to test for the IoT Damp and Mould Sensor Project



4. Methods and analysis

Semi-structured interviews

- Conduct 20-25 semi-structured interviews with borough housing and data teams across 16 participating councils.
- Interviews will capture deployment details, stakeholder engagement, and how insights have been used and any changes to processes.
- Interviews will also employ the Most Significant Change (MSC) technique to elicit narratives about the most impactful changes observed as a result of the project, providing rich qualitative data to complement thematic analysis.

Thematic Analysis

- Analyse interview data using thematic analysis (Braun and Clark 2004).
- Use it to identify recurring themes, patterns, and variations in deployment strategies, use case effectiveness, and operational changes. This will also help synthesise qualitative insights into actionable findings.

Use cases and case studies

- Identify and categorise a range of use cases for the damp and mould sensors.
- For our purposes, a use case is defined as a ‘scenario of how damp and mould sensors are used to achieve a particular objective or solve a specific problem’.
- Develop examples of successful use cases to illustrate lessons learned and provide evidence for recommendations.

Process mapping

- Map and compare "before" and "after" processes to assess changes enabled by sensors
- The process mapping exercise will understand the current ‘as is’ process, and the ‘ to be’ process following the implementation of the damp and mould sensors.
- It will help provide a demonstration of both the impact of the project on how damp and mould issues in council-owned housing stock are dealt with, and potential opportunities for other councils.
- Draw on the Process Mapping method used by Jacobs in their assessment of the Glasgow City Region’s Smart and Connected Social Places Programme.

Annex B: List of participating councils

Table 1. List of participating boroughs, with project stakeholders interviewed

Participating borough	Interview status
Barking and Dagenham	Interviewed
Barnet	Interviewed (NB: did not receive sensors)
Camden	Interviewed
Ealing	Interviewed
Enfield	Not Interviewed
Greenwich	Not Interviewed (NB: shared details of work)
Hackney	Interviewed
Hammersmith and Fulham	Interviewed
Harrow	Interviewed
Hillingdon	Interviewed
Hounslow	Interviewed
Islington	Interviewed
Kensington and Chelsea (RBKC)	Interviewed
Kingston Upon Thames	Interviewed (NB: did not receive sensors)
Merton	Interviewed
Redbridge	Interviewed
Southwark	Not Interviewed
Sutton	Not Interviewed (NB: Lead borough, no sensors)
Waltham Forest	Interviewed
Westminster	Interviewed
IoT Solutions Group	Interviewed (NB: sensor provider)

Annex C: Mapping use cases employed by each borough

Borough	Early identification	Understanding causes of mould	Resident engagement	Predictive maintenance
Barking and Dagenham	✓			
Barnet			✓	✓
Camden				✓
Ealing		✓	✓	
Greenwich	✓	✓	✓	
Hackney				✓
Hammersmith and Fulham	✓	✓	✓	
Harrow	✓			
Hillingdon	✓			
Hounslow	✓		✓	
Islington	✓	✓	✓	
(RBKC)	✓			
Merton	✓	✓		
Redbridge	✓			✓
Waltham Forest				✓
Westminster	✓	✓		

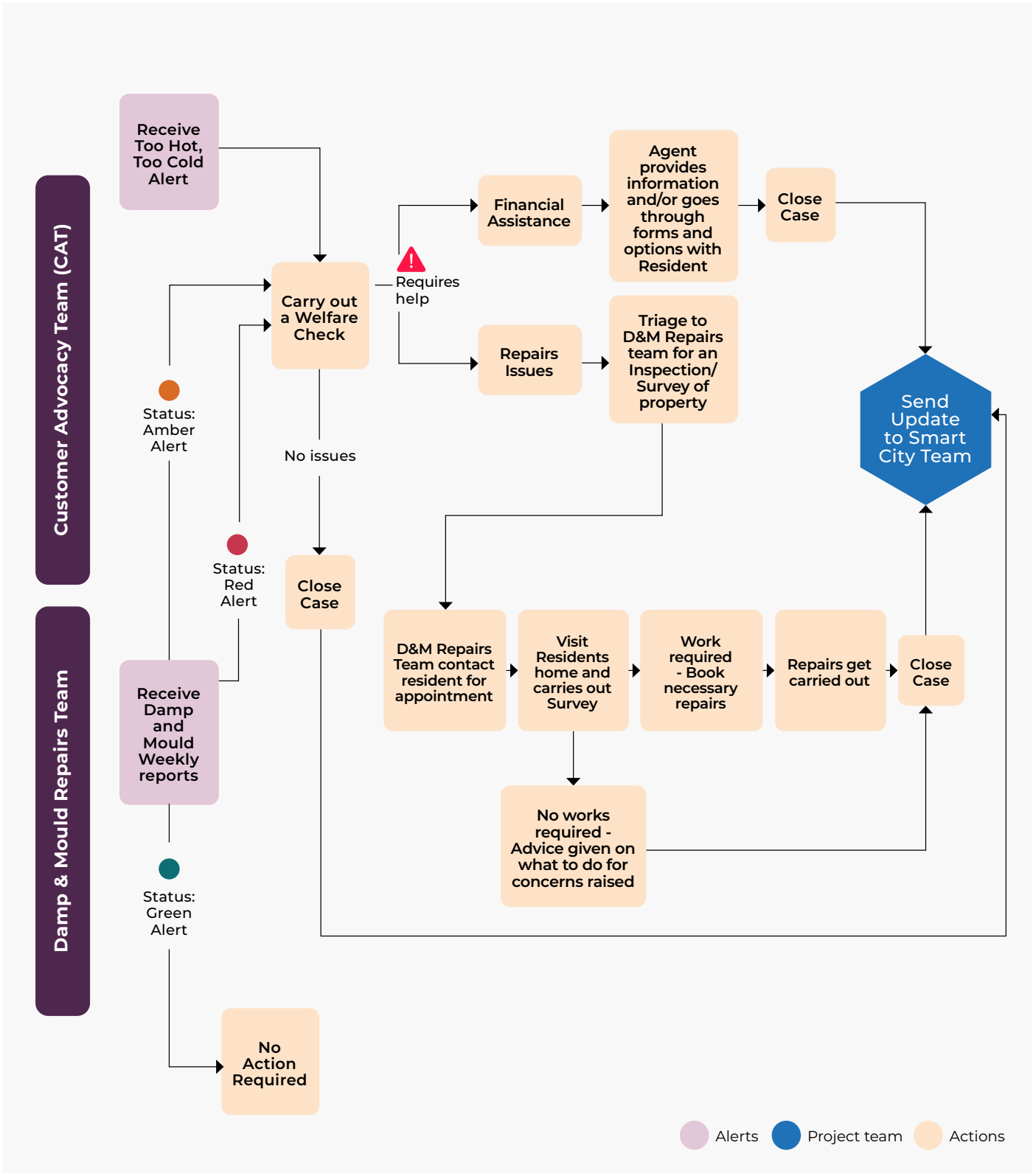
(1/2)

Annex C: Mapping use cases employed by each borough

Borough	Generating a holistic view	Evidence for legal cases	Assessing temp accom.	Assessing high temp risks
Barking and Dagenham				
Barnet	✓			
Camden				
Ealing				
Greenwich	✓			
Hackney				
Hammersmith and Fulham				
Harrow		✓		
Hillingdon		✓		
Hounslow				
Islington				
(RBKC)				
Merton			✓	✓
Redbridge				
Waltham Forest				
Westminster				

(2/2)

Annex D: Westminster's Sensor Enhanced Damp and Mould Process Map



About LOTI

The London Office of Technology and Innovation is London local government's collaborative innovation team. We help London borough councils and the Greater London Authority use innovation, data and technology to be high performing organisations, improve services and tackle London's biggest challenges together.

Read more at: loti.london

If you have any questions or feedback on this report, please contact:
contact@loti.london