



# Using digital sensors to reduce the risk of surface water flooding

Surface water flooding is a growing problem across West Yorkshire, disrupting residents and businesses, and damaging properties and infrastructure.

A major issue is that there are no systems in place for early warnings of this type of flooding. Our response is reactive rather than proactive which is an inefficient use of resources and doesn't allow organisations to work together to tackle the problem.

Flooding of rivers is well-monitored with warnings in place whereas surface water flooding is difficult to predict.

West Yorkshire Flood Innovation Programme (WY FLIP) leaders successfully bid for £97,000 from the Government's Local Digital Fund to explore using 'smart' technologies to come up with a solution.

A project team has been investigating using LoRaWAN (Long Range Wide Area Network) as a viable flood warning system to provide accurate, real-time information and improve the response to surface water flooding events.

## What is LoRaWAN and how does it work?

LoRaWAN is a network, which enables long-range communication between low-power devices, using radio frequencies via the AM network. Data is collected regularly from digital sensors and sent encrypted to a gateway. The gateway receives the information and securely transmits it to the organisations' dashboard to be processed and displayed. The dashboard can be customised to show the data in graphs, maps or tabular forms and send alerts to response teams. Sensors are available for many different applications including surface water levels and rain gauges. This information can be used to make decisions about flood infrastructure maintenance, flood mitigation or incident response. All organisations involved in managing flood risk can access the data in real-time via a shared platform. Historical data is available to analyse incidents and long-term trends through an internal dashboard with sharing capability, an app, website or software such as Resilience Direct.

## Key benefits of LoRaWAN

- LoRaWAN is an internationally recognised and reliable system for sensor data collection. It is already used by UK local authorities with the potential to mitigate flooding.
- The system can be scaled up once the gateway and dashboard have been established and has multiple uses.
- LoRaWAN is a cost effective system to introduce and a network of data collection points could be built quickly given the existing network of gateways.
- Surface water sensors would enable a targeted, proactive approach to help flood managers maintain infrastructure, provide a better response to flood incidents and carry out analysis of incidents.
- Data can be available in real time to help make better decisions during incidents, show the extent of surface water flooding and timing at specific locations and create an early flood warning system to target hotspots.
- Service providers, members of the public, flood wardens and community flood action groups can have access to the data.





## How is LoRaWAN being used already?

### Flood alerts:

Two LoRaWAN water level sensing bollards are set to be installed near a car park known to flood in Wetherby. One sensor will be in the river to show the height as it rises and falls. The other will be on the bank to show if the water level rises above it. During a flood, the first sensor would alert about a possible breach of bank, the second sensor would monitor the flood level in relation to the car park. There are plans to connect the bollard alerts to social media so the public can monitor river levels and be warned to move their cars in advance of flooding.

### Measuring Air Quality:

Leeds City Council is working with University of Leeds to create an air quality network in the city. There are 45 air quality sensors across Leeds, which send data to the nearest gateway.

### COVID footfall mapping:

During the COVID pandemic, sensors were installed on lamp posts to count footfall across Leeds. An online map was created using a traffic light colour system to show the public how crowded areas were.

### In Norfolk:

There are 110 gateways across Norfolk which are accessible and free for the public.

These are used for:-

- Social care – to manage wellbeing
- Digital telemetry for traditional windmills
- Monitoring traffic with heatmaps
- Measuring temperature and humidity in public buildings
- Alerts when traffic lights don't work, measuring air quality and noise pollution
- Monitoring gullies and water levels under bridges
- Education programmes in schools.

## What has happened so far?

The first stage of the LoRaWAN project has been completed investigating how Leeds, Kirklees and Wakefield currently respond to flood incidents and what is needed to set up the system.

Flood wardens, community groups and flood risk managers have been consulted about risks and opportunities, flooding hotspots, data collection and technology.

Hotspot maps have been produced, based on incident data, highlighting areas to target.

## What next?

We are looking for funding to pilot LoRaWAN to improve our response to surface water flooding across the region.

## Want to know more?

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or scan the QR code below



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