

## A new frontier in sustainable water management

Every day, vast quantities of treated water are lost before they reach the people who need it, driving unnecessary carbon emissions, wasting energy and intensifying pressure on a critical natural resource.



Globally, more than 32 billion cubic metres of water disappears each year through leaks. In many developing regions, losses can reach up to half of total supply, placing infrastructure under strain and depriving communities of a resource essential to economic security as well as health and wellbeing

At the University of Nottingham Malaysia, researchers are developing a new approach: intelligent systems that detect leaks early and autonomously.

### A new approach to water leak detection

Conventional detection methods are often reactive, expensive and difficult to scale but by embedding intelligence directly within water networks and using compact, low-power hardware, the system continuously monitors pipes for the subtle signs of water leakage.

By combining acoustic sensing and vibration analysis, it can detect the distinctive signatures created when pressurised water escapes, even at an early stage. Using AI, the device processes signals in real time, eliminating the need for cloud connectivity and reducing energy demands. Detection results are then transmitted wirelessly via LoR (long range) peer-to-peer communication, enabling remote monitoring without wired connectivity.

The technology has been tested using a purpose-built simulation rig, designed to replicate real leak conditions across a range of pipe defects. With an accuracy of 88% the system demonstrates the potential for reliable, early-stage intervention. Wireless communication enables remote monitoring, in both urban and isolated or rural environments.

### From research to deployment

Developed in collaboration with industry and technology partners, the project is designed with real-world applications in mind.

Future work will focus on:

- Scaling the system across operational water networks
- Partnering with utilities across ASEAN
- Advancing intelligent, self-monitoring infrastructure

### Towards a smarter water future

Water loss may be hidden, but it is not unavoidable. By embedding intelligence within infrastructure, this research points towards a future where water systems are proactive, adaptive and resilient. This innovative technology directly supports our commitment to Sustainable Development Goal 6 by improving water efficiency, reducing losses and safeguarding one of our most essential natural resources.

## The team behind the research

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