



LEAKAGE ROUTE MAP

Innovation Annex



Meeting the challenges of the route map will require collaboration and innovation within the UK on an unprecedented scale.

There are limited opportunities to adopt knowledge and innovation from outside the UK due to specific UK requirements on leakage & network management (e.g. CSPL, mains renewal scale, interruptions to supply).

We will need to draw together the joint research programme (UKWIR), the national innovation (Ofwat), Company programmes and 3rd party developments to create a holistic development plan.

This annex draws together our initial work on the biggest innovation themes, highlighting the most urgent priorities for each.

THEMES

01 Quantifying background leakage

02 Better understanding of CSPL

03 Optimised network pressures

04 Smart networks, increased sensors and AI/ML

05 Efficient and Effective ALC with reduced resource

06 Innovative repair techniques

07 Renewing the network and ensuring leak free mains

08 Developing a decision making framework

09 Information and knowledge sharing

UKWIR BQ2

UKWIR routemap & projects.

Innovation Competition

Catalyst & Transform projects.
Innovation challenge calls.

Water Companies

Follow best practise.
Consistency reporting.
Adoption of new techniques.

3rd Party (regulator, supply chain, academia, consultants)

Recognition of frameworks.
Shared goals & rewards.
Development of solutions.

THEME 01

Quantifying background leakage

The adaptive pathway chosen will be extremely sensitive to the level of background leakage. The level of background leakage could have significant bearing on the most cost-effective pathway taken, and a further consideration is what to effectively do about background leakage, and if it is indeed at all possible to target asset renewal to reduce it.

UKWIR BQ2

Analyse and quantify “Minimum achieved leakage” (MAL) and “Minimum achievable leakage” (MAbL).

Understand the real components of MAbL.

Understand the impact of ALC in driving down leakage levels to both MAL & MAbL.

Define a consistency of approach to calculation of MAbL.

Develop existing or new models to extrapolate results for DMA's.

Innovation Competition

Investigate the potential to use open data to share and analyse multiple Company's data.

Develop tools and software to analyse current background leakage.

Develop advanced sensors and equipment to continually lower the detectable level of leakage.

Water Companies

Ensure all water companies are utilising the latest ALC techniques and deploying them effectively.

Assist in the development and trials of advanced sensors and equipment.

Develop and adopt consistent reporting of Background/MAL.

3rd Party

Potential for Background/MAL methodology to be accepted by regulator as part of PR24 process.

Background/MAL methodology to be incorporated into existing management & reporting packages.

Develop tools and software to analyse current background leakage.

Develop advanced sensors and equipment to continually lower the detectable level of leakage.

THEME 02

Better understanding of CSPL

The presence of customer side leakage as part of total leakage represents a significant “known unknown” as limited asset records or information is available. Achievement of the PIC and longer-term reductions of leakage may be very dependent upon what happens with customer side leakage. Companies with large volumes of smart meter data will need to lead, as this provides the best intelligence in relation to customer supply pipe leakage volumes and breakout rates.

UKWIR BQ2

Continue to develop our understanding of the number and leakage rates of customer supply pipes and internal plumbing losses.

Investigate using anonymised data from companies currently deploying smart metering to run a hackathon or sprint to increase understanding.

Innovation Competition

Investigate the potential to use open data to share and analyse multiple Company's data.

Develop existing and additional techniques for the repair and replacement of supply pipes.

Water Companies

Ensure all water companies are utilising the latest supply pipe leak repair techniques and deploying them effectively.

Share findings to ensure that CSPL policies align with current understanding and best practice.

Assist in the development and trials of novel detection, repair and replacement tools.

3rd Party

Continue to develop leak location solutions specifically for supply pipes.

Continue to develop leak repair and supply pipe replacement solutions.

Lobby for the removal of wasteful/leaky fittings from the supply chain.

THEME 03

Optimised network pressures

Reducing the water pressure in a network reduces the flow rate of any leaks. The pressure in the network may need to be further reduced from current levels and better managed. New pressure reducing valves may need to be installed, as well as existing district metering areas and pressure management schemes being fully optimised. A culture of calm networks will need to be adopted so that less issues are caused by operations on the network that lead to leaks.

UKWIR BQ2

Continue to develop our understanding of the relationship between DMA size & layout, pressure management and leakage rate.

Use the latest understanding of pressure transients to better model the relationship between calm networks and leakage.

As understanding and techniques improve, provide bench-marking and best practise workshops.

Innovation Competition

Develop techniques to manage pressures using multiple control points within a DMA.

Develop techniques for pump management, small pump installations and tall buildings solutions.

Develop existing and additional techniques for the control of pressure in the water network.

Develop existing and additional techniques for calming the water network.

Water Companies

Ensure all water companies are utilising the latest pressure reduction methods and deploying them effectively.

Ensure all water companies are utilising the latest network calming methods and deploying them effectively.

Assist in the development and trials of novel pressure management and network calming solutions.

3rd Party

Ensure that regulatory reporting does not disincentivise companies from modifying and optimising networks pressure.

Encourage and incentivise companies to adopt pressure management and network calming techniques that maximise asset longevity.

Continue to develop pressure management and calm network solutions.

THEME 04

Smart networks, increased sensors and AI/ML

A number of water companies have trialed or implemented smart networks, which typically combine high frequency data with predictive modelling. However, the full benefits to leakage are not fully understood. If the techniques are more effective than seen in the trials, then there could be additional leakage savings [or reductions in cost]. Similarly, if the techniques are less effective, then they could cause costs to rise. In addition, trials of the smart networks are still relatively new, hence the true asset life of the sensors and associated assets are not yet fully known.

UKWIR BQ2

Continue to develop our understanding of the leakage benefits of smart networks, based on DMA size, sensor type & location, data granularity & frequency and data analysis techniques.

As understanding and techniques improve, provide bench-marking and best practise workshops.

Investigate the long term life of sensors and associated assets.

Innovation Competition

Develop existing and additional sensors and communication protocols for deployment into smart networks.

Develop existing and additional data analysis techniques to enhance the leak detection capabilities and benefits of smart networks.

Investigate the potential to use open data to share and analyse multiple Company's data.

Water Companies

Share findings to ensure that lessons and experiences from trials are learnt across the industry.

Assist in the development and trials of sensors, communication protocols and analysis techniques.

3rd Party

Continue to develop sensors and data analysis techniques.

Investigate the potential for adoption of common standards for smart network data.

THEME 05

Efficient and Effective ALC with reduced resource

A number of water companies and their contractors are reporting difficulty in recruiting and retaining trained ALC technicians. In addition, the future costs of active leakage control resource is a significant uncertainty. The large amount of insight that will be gathered from smart networks means that ALC technicians will potentially become more effective. Technology that assists with detection continues to be developed, also assisting with these activities.

UKWIR BQ2

Ensure we understand the impact of ALC in driving down leakage levels to near MAbL.

Develop effective benchmarking and comparison tools to highlight and showcase islands of excellence.

Understanding why conventional ALC methods often fail to detect leaks.

Understanding how best to use ALC methods and equipment on plastic networks.

Innovation Competition

Develop tools and techniques that allow ALC to be effectively carried out during sociable hours.

Water Companies

Ensure all water companies are utilising the latest ALC techniques and deploying them effectively.

Carry out root cause analysis to identify the reasons for current recruit & retention difficulties.

3rd Party

Investigate the potential for international qualifications to attract ALC technicians with transferable skills.

Continue to develop new technologies and techniques that optimise the effectiveness of ALC technicians.

THEME 06

Innovative repair techniques

The recent leakage innovation heatmap project highlighted the current lack of innovation in this area. As a result, water companies have already come together to investigate how repairs could be made more efficient through group projects and UKWIR research. In order to reduce leak run times, the water industry need to develop and adopt solutions that assist with cost effective sustainable repair techniques and also reduce disruption.

UKWIR BQ2

Investigate methods to develop and fast-track testing methodologies for innovative repairs (speed of repair, ability to seal leaks, longevity etc.)

Investigate and benchmark contract terms & conditions to reduce the time taken to repair leaks.

As understanding and techniques improve, provide bench-marking and best practise workshops.

Innovation Competition

Develop test sites for investigating and trialling repair techniques isolated from the clean water network to enhance development time.

Develop existing and additional techniques to carry out innovative repairs.

Develop existing and additional techniques for temporary repair and methods to reduce background leakage.

Water Companies

Ensure all water companies are utilising the latest repair technologies.

Trial new solutions as available.

Investigate ways to reduce the time taken for Reg 31 approvals.

Provide simple benchmarking solutions to ensure that easy repair comparisons can be made between companies (e.g. cost/repair, clamp vs cut-outs ratio).

3rd Party

Investigate ways to reduce the time taken for Reg 31 approvals.

Continue to develop new technologies and techniques to reduce the time taken to repair leaks.

THEME 07

Renewing the network and ensuring leak free mains

The benefits of mains renewal and supply pipe replacement can be seen with the reduction in leakage seen in Japan & Holland after the network was extensively renewed. Currently, average mains replacement rate/year in the UK is less than 0.3%/year. Alternative policies like semi-structural lining are well developed internationally and seem promising, but are difficult to introduce, primarily due to UK supply interruption policies. In addition, replacement pipes or linings must be installed correctly. There remains a significant number of failures seen on new pipes.

UKWIR BQ2

Trial & demonstrate how very low leakage can be achieved in new plastic networks.

Investigate methods to develop and fast-track testing methodologies for innovative renewal solutions.

Investigate and benchmark contract terms & conditions to enhance the use of innovative renewal solutions.

Innovation Competition

Develop test sites for investigating and trialling renewal and semi-structural lining techniques isolated from the clean water network to enhance development time.

Develop existing and additional techniques to replace and rehabilitate mains and supply pipes.

Water Companies

Ensure all water companies are utilising the latest renewal and rehabilitation technologies.

Trial new solutions as available.

Investigate ways to reduce the time taken for Reg 31 approvals.

Introduce an accreditation scheme for the joining of plastic pipes to ensure consistency across companies.

3rd Party

Investigate ways to reduce the time taken for Reg 31 approvals.

Investigate how regulations and ODI's (particularly supply interruptions) can be modified to enhance the adoption of innovative solutions.

Continue to develop new technologies and techniques to replace and rehabilitate mains and supply pipes.

THEME 08

Developing a decision making framework

A high-level framework is key to developing the leakage route map to 2030 and beyond to 2050 for all companies. Vital in its success is the delivery of the AMP7 leakage reduction commitments. Knowledge and information sharing is an important requirement, along with resolving some of the key questions that have been posed. This is supported by an adaptive pathway process that each company can follow to achieve their most appropriate pathway given their conditions.

UKWIR BQ2

Redraft and reprioritise the UKWIR Routemap to reflect the new insights required.

Innovation Competition

Ensure that leakage projects that align with the adaptive pathway leakage process are prioritised.

Water Companies

Adopt the adaptive pathway leakage process and integrate with the water resources management plan.

3rd Party

WaterUK to provide leadership in the adoption and development of the adaptive pathways.

Regulators to recognise the adaptive pathway leakage process and recommend this approach for PR24 submissions.

THEME 09

Information and knowledge sharing

The industry needs to develop and find effective ways of sharing information at a sufficient level of detail that doesn't necessarily share sensitive detail, but can help other companies understanding what solutions, technologies, processes, innovations and interventions work effectively. For leakage levels to be reduced significantly in AMP7 and beyond, sharing key lessons learnt will be essential. A mid-AMP7 knowledge share in advance of PR24 may be highly beneficial in developing adaptive pathways. Due to the regulatory regime this sharing is not always to be the benefit of the individual company, but is for the "greater good" of the industry. This sharing of information should be encouraged as it reduces duplicate effort and allows innovations to be benefitted by all more quickly. However some mechanism should be considered so that the companies are rewarded for this sharing.

UKWIR BQ2

Innovation Competition

Water Companies

3rd Party

Use Spring to effectively disseminate learning and understanding gained.

Investigate the potential for an expert knowledge leakage website aligned with the adaptive pathways process.

Share current company research that assists with learning and development of the adaptive pathways. [Innovation heatmap].

Share progress on the adoption of the adaptive paths leakage process and the technologies used with successes/failures.

Regulators to investigate how to incentivise and reward knowledge sharing.

WaterUK to provide a governance and guidance panel.