Antimicrobial Resistance and the Water Sector

Current Landscape and Recommendations

ARUP

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EPSRC Digital Health Hub for Antimicrobial Resistance

UKWIR UK Water Industry Research

PRIFYSGOL BANGOR UNIVERSITY

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Preface

On Tuesday 10th June 2025, a series of representatives across the water sector gathered in London to recognise and discuss the challenge of antimicrobial resistance (AMR), how the UK water sector is positioned and can support in responding to the challenge.

The workshop brought together participants from water utilities, regulators, public health bodies, academia, and research institutions to explore how the sector can better understand, monitor, and respond to AMR in the environment. With antimicrobial resistance recognised by the World Health Organization as one of the top global health threats, there is a growing need to identify practical, coordinated actions across sectors including those responsible for managing our water systems.

Through a combination of expert presentations and structured discussions, the session explored the current state of knowledge, existing initiatives, and gaps in data, regulation, and capability. It also provided space for participants to share perspectives on where the water sector can lead or contribute as part of a wider One Health approach to AMR.

This report summarises the key points raised during the workshop, including emerging themes, areas of consensus, and potential next steps. It is intended as a reference point for those involved in or considering work on AMR in the water environment, and as a starting point for continued collaboration across the sector.

Acknowledgements

We are grateful to all those who contributed their time, expertise, and insight to this workshop. The level of engagement and openness across disciplines reflected a shared commitment to tackling AMR through collaboration, evidence, and action. While this report summarises the key themes and points of discussion, it cannot capture the full depth of conversation and expertise shared on the day. The value of this workshop lies not only in the outputs, but in the connections made and the momentum generated to take this work forward.

All information collected during this workshop was done so under 'Chatham House' rules and no statements made in this document reflect the views of the individuals or the organisations they represent.

Thank you to speakers (marked * in the attendees list), contributors to the final document alongside the reviewers.

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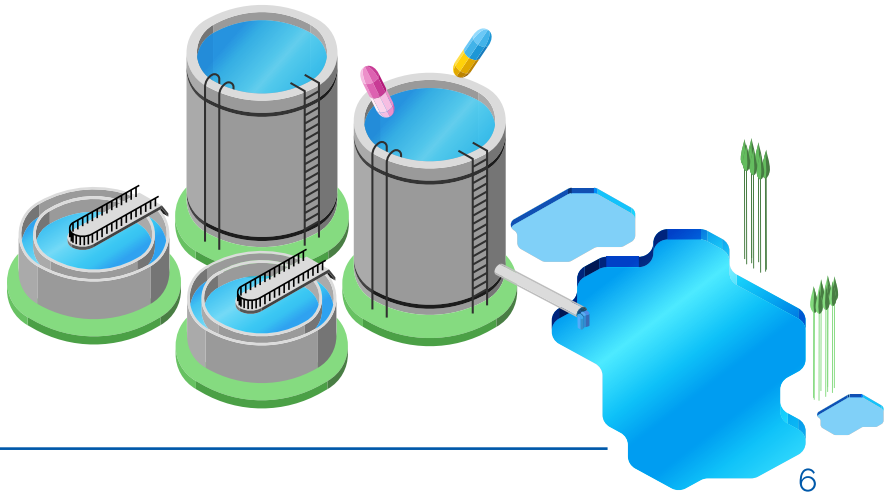

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Background

Introduction

Antimicrobial resistance (AMR) is the ability of microbes to withstand treatment with antimicrobial agents such as antibiotics and antifungals. It has emerged as one of the most pressing global health threats of the 21st century, with projections suggesting that by 2050 AMR could cause more deaths than cancer[1]. A landmark study in The Lancet estimated that bacterial AMR was directly responsible for 1.27 million deaths worldwide in 2019, a figure that already surpasses the toll of HIV/AIDS and malaria[2]. The implications are profound: routine medical procedures, from surgery to chemotherapy, rely heavily on effective antimicrobials, and their failure would place millions of people at increased risk of severe infection and death.

With a simplified overview, AMR arises when bacteria acquire genetic traits that protect them from the drugs and chemicals designed to kill them. These traits can spread rapidly between different bacterial cells, making standard treatments ineffective and infections harder to control. The result is longer hospital stays, increased healthcare costs, and greater reliance on last-resort drugs, which themselves are under threat as resistance continues to spread. With the emergence of multi-drug resistant bacteria, there are increasing reports of infections which are either difficult or impossible to treat[2].

Tackling AMR requires a coordinated, cross-sector response, often framed within the "One Health" approach, which recognises the interconnectedness of human, animal, and environmental health. While much attention has focused on the clinical and agricultural dimensions of AMR, there is growing recognition of the crucial role played by the environment, particularly water systems, in its development and transmission.

This report focuses on the UK water sector's role in combating AMR. The sector is increasingly recognised as both a pathway through which resistance spreads and a potential intervention point where monitoring, innovation, and management practices can help reduce risks. As awareness of environmental contributions to AMR grows, the water industry is moving from being a passive backdrop to an active participant in global AMR mitigation efforts.

Global AMR Deaths (2019)

1.27 million

Deaths directly caused by drug-resistant infections in 2019

Projected Annual AMR Deaths (2050)

10 million

Potential annual deaths from AMR by 2050 (if no action is taken)

AMR in the Water Environment

Water bodies and wastewater systems can inadvertently become reservoirs and transmission routes for resistant bacteria and their genetic material. The UK Health Security Agency (UKHSA), in partnership with the Environment Agency, has identified that sites like rivers and bathing waters may harbour antibiotic-resistant microorganisms and is prioritising surveillance in these environments[3]. Wastewater treatment plants, where household, healthcare and industrial effluents converge, are potential "hotspots" for mixing different microbial populations. Studies suggest that treatment processes might even spread resistance through tiny airborne droplets (bio-aerosols) emitted at treatment facilities[4].

Moreover, the by-products of wastewater treatment require attention. Sewage sludge, the semi-solid residue, often contains traces of antimicrobial compounds and resistance genes. Recent industry research indicates that sludge analysis could serve as an effective tool for monitoring AMR levels[5], and further studies are underway to understand the fate of these resistance elements when treated sludge is reused (for example, as agricultural fertiliser). There is also growing concern that resistance genes and antibiotic residues may persist in soils after sludge application, potentially entering food chains or leaching into watercourses. This highlights the importance of developing robust risk assessments and monitoring frameworks for biosolids use in agriculture.

Industrial and pharmaceutical discharges present a further dimension to this challenge. Wastewater systems often receive effluents containing active pharmaceutical ingredients or residues from manufacturing sites, hospitals, and care facilities. These inputs can create localised hotspots of selective pressure that favour the emergence and persistence of resistant strains. As regulators strengthen controls on pharmaceutical emissions, sludge and effluent monitoring could play a dual role: helping to track compliance while also informing broader surveillance of environmental AMR.

While the overall public health risk from environmental AMR is still being quantified, these findings make clear that the water sector intersects with the AMR challenge at multiple points: from the quality of discharged effluent and its impact on rivers, to the management of sludge and the protection of wastewater workers. Tackling AMR is therefore not just a medical or pharmaceutical issue; it also involves environmental management where water professionals have a critical part to play.

Policy &

Collaboration Drivers

Governments and regulators are increasingly recognising the water sector's role in tackling antimicrobial resistance (AMR). In the UK, this is reflected in the AMR Action Plan, first published in 2019 to support catchment-based research and standardised monitoring of resistance in rivers and coastal zones, updated in 2024 to emphasise targeted environmental AMR monitoring[6]. Across Europe, reforms such as the revised Urban Wastewater Treatment Directive (UWWTD) are setting stricter standards to protect public health, including new requirements for monitoring pathogens and antibiotic resistance at treatment works. These changes underline the growing view that wastewater systems are not only critical infrastructure but also integral to wider public health protection[7].

One area receiving particular attention is the pharmaceutical sector. Drug manufacturing and hospital discharges are recognised as important pathways for antibiotic residues and active pharmaceutical ingredients to enter the watercourse, contributing to the spread of resistance. The European Commission's Strategic Approach to Pharmaceuticals in the Environment calls for improved management of pharmaceutical emissions, while several member states have introduced tighter national rules on effluent treatment at production sites and healthcare facilities8. In the UK, regulators including the Environment Agency and MHRA are exploring how existing frameworks could be strengthened to reduce pharmaceutical contributions to AMR in surface waters[8]. These developments are creating new points of intersection between the health, pharmaceutical, and water sectors, reinforcing the need for joint action.

For water companies, this shift means moving beyond conventional pollutant control towards deliberate AMR mitigation strategies. That includes improving how resistance genes are detected and quantified in wastewater, upgrading treatment processes to remove antibiotic residues, and adopting lessons from the health sector to limit the spread of resistant microbes. Importantly, the regulatory landscape is not just a compliance challenge but also a driver of collaboration. By bringing together the operational expertise of water utilities, the regulatory oversight of government agencies, the innovation capacity of pharmaceutical manufacturers, and the knowledge of academic researchers, more effective surveillance and control measures can be developed.

This collaborative approach is increasingly recognised as essential to align with "One Health" principles, which link human, animal, and environmental health in the fight against AMR. In responding to these pressures, the water sector has the opportunity not only to safeguard its own compliance but also to act as a key partner in a broader public health mission.

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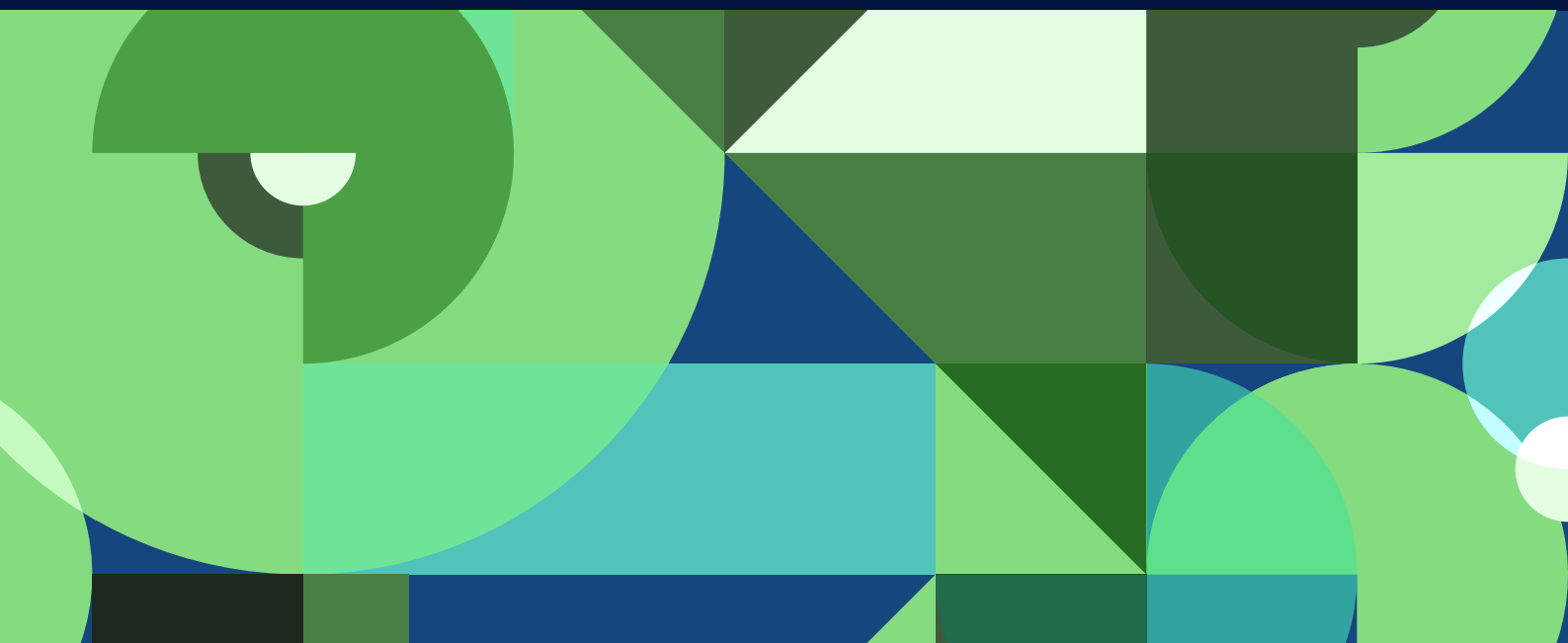
Understanding Stakeholder Landscape



A targeted stakeholder landscape review was conducted to map the roles, responsibilities, and points of interface of key actors involved in tackling AMR from a water sector perspective. The aim was to highlight areas of alignment, identify existing gaps, and pinpoint opportunities for stronger collaboration across disciplines and organisations The review considered stakeholders from across both local and national government, including relevant departments and agencies, as well as academia, industry, and the wider public.

Consumer groups and advocacy charities were also identified as important voices, particularly in raising awareness and influencing policy. Together, this landscape provides a clearer picture of how different actors contribute to addressing AMR in the environment and where coordinated action could deliver the greatest impact.

Abattoirs
Academic Universities
Activist Groups
Animal Charities
Animal Plant Health Agency
British Retail Consortia
Cabinet office
Care Homes
Centre for Environment, Fisheries and Aquaculture Science
Chief Medical Officer
Citizen Scientists
Consultancies
Consumer Council for Water
Customers
Department for Environment, Food & Rural Affairs
Department for Trade
Devolved Governments
Education Sector
Environmental Monitoring Labs
Environmental Regulators
Environmental Select Committees
European Commission
EU-WISH
Farming Organisations and Unions
Food and Agriculture Organisation
Fungal Academic / Industry Networks
Global Antibiotic Research and Development Partnership
Home office
Hospitals
Learned Societies
Local Councils
Local Government
Local Infection Control Networks
Local NHS Health Boards
National Institute for Health and Clinical Excellence
NHS England
OFWAT
Other Industries e.g. Manufacturing
Pharmaceutical Companies
Pharmaceutical Supply Chain
Pharmaceutical Industry Associations
Policy Makers
Port health officials
Private Healthcare Prescribers
Public Health Agencies
Research Councils
River Advocacy Groups
Scottish Environment Protection Agency
Shellfish Industry
Tech Sector
Transport Hubs
UK centre for Ecology and Hydrology
UK Water Industry Research
United Nations
Veterinary Medicines Directorate
Vulnerable customers
Water Companies
Water Company Investors
Water Membership Organisation
Water Sports Groups
World Bank
World Health Organisation
World Organisation of Animal Health

Representatives from the water sector were asked to map the

identified stakeholders onto a chart that assessed both their current level of influence and their degree of advocacy for action on antimicrobial resistance (AMR) within the sector. To support consistency, a consensus framework was applied to categorise each stakeholder into an appropriate group and to capture perceptions of their relative influence. This approach provided a structured view of which stakeholders are seen as key drivers of change, which hold influence but are less active on AMR, and where there may be opportunities to strengthen engagement.

Key stakeholders identified include:

Regulators and Compliance

OFWAT, the Environment Agency (EA), and the Drinking Water Inspectorate (DWI), Scottish Environmental Protection Agency (SEPA) and Natural Resources Wales (NRW) each with differing mandates related to environmental protection, public health, and water company performance.

Government departments and agencies with links to the water sector

DEFRA, EA and DHSC, with cross-cutting responsibilities in environmental policy, disease surveillance, and national AMR strategy development. The perception on their engagement with the water sector was considered.

Water companies

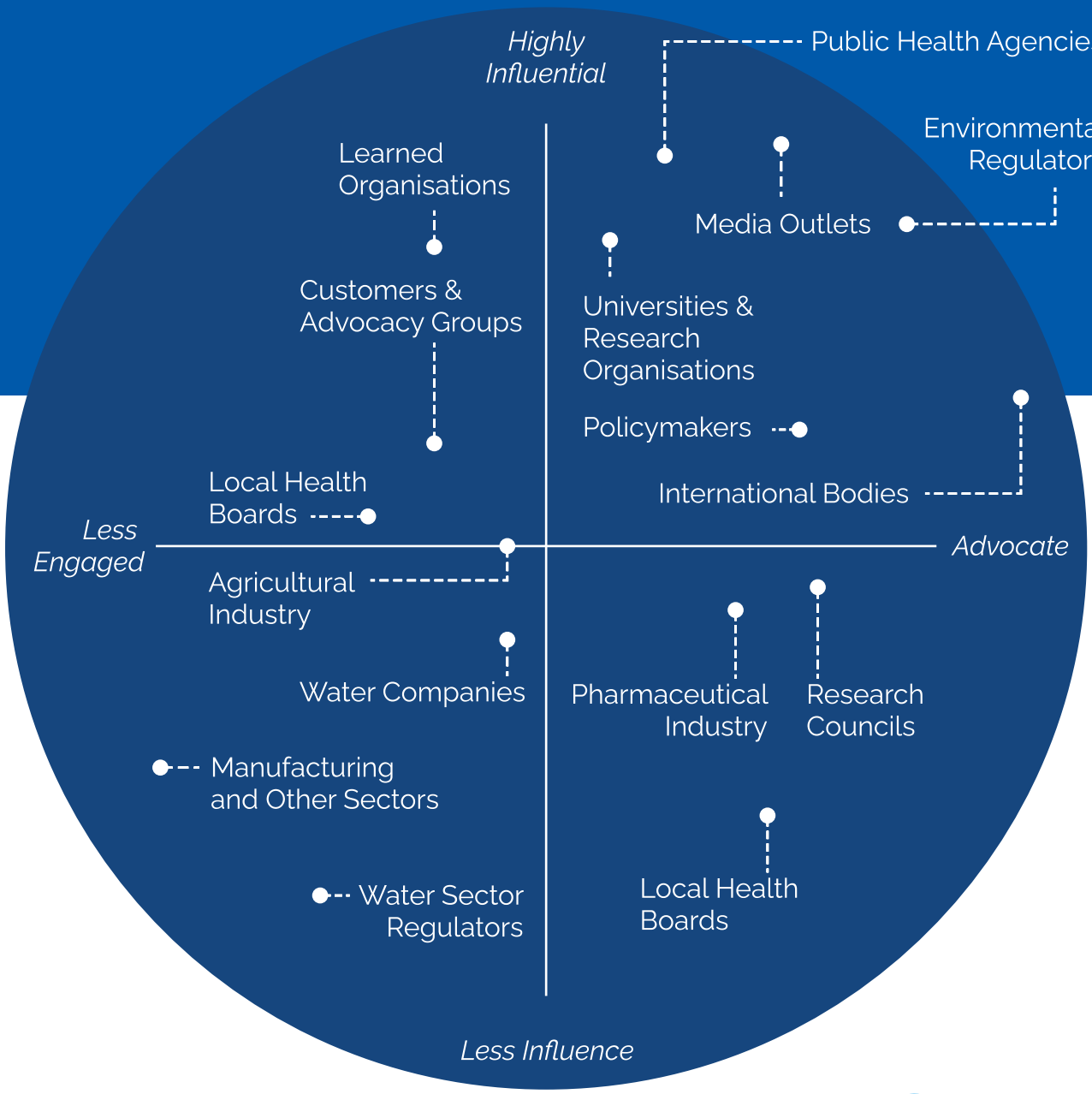
Responsible for wastewater treatment, compliance, and environmental stewardship, yet historically limited in their remit to monitor AMR directly.

Academic and research institutions

Driving innovation in AMR detection, metagenomics, and environmental surveillance, often funded through UKRI research councils including the EPSRC, BBSRC and NERC working alongside Innovate UK.

Public health bodies

Including the UK Health Security Agency, Public Health Wales, Public Health Scotland and local health protection teams, who play a central role in risk assessment, disease monitoring, and coordinating response frameworks.



A map of the stakeholder influence landscape

Workshop participants shared a clear consensus on the significant and growing threat posed by antimicrobial resistance (AMR), particularly through environmental pathways such as wastewater and sludge. Despite a shared recognition of risk, participants highlighted the lack of formal mechanisms to coordinate activity across the diverse actors working at the interface of water, health, and the environment. The fragmentation in parts of the water sector continues to result in duplicated effort, limited data sharing, and a slower pace of innovation adoption.

There was strong agreement on the strategic importance of cross-sector collaboration. Clarifying the role of water companies within evolving legislative and regulatory frameworks, such as those emerging from the UK AMR Action Plan (2024–2029) was viewed as critical. Participants identified the Ofwat Innovation Fund and other existing mechanisms as practical routes to bring stakeholders together, enabling investment in pilot programmes and collaborative research focused on emerging contaminants, including antimicrobial residues and resistance genes.

The outcomes of this workshop reinforce a shift in perspective: the water sector should not be seen solely as a downstream recipient of AMR risks, but rather as an active partner in research, surveillance, and mitigation. This reframing aligns with the One Health approach underpinning the UK's national AMR strategy and reflects the need for more deliberate integration of environmental evidence into public health responses. The stakeholder mapping conducted for this project helped shape the workshop design and provides the foundation for the recommendations set out in this report.

Improving Connectivity Across the Stakeholder Ecosystem

A key theme emerging from the workshop was the need to strengthen coordination between the water sector and related areas such as public health, environmental regulation, academic research, the pharmaceutical sector and local government. Participants highlighted the value of creating structured platforms that enable regular communication, joint priority setting, and shared approaches to monitoring and evidence use.

One specific recommendation was the formation of a national coordination forum or working group focused on AMR in the environment. Such a forum could bring together key stakeholders to align methodologies, improve data compatibility, and support more consistent application of policy across sectors. This would also help accelerate the integration of environmental surveillance, such as wastewater monitoring, into national health protection frameworks. It would begin to close the current gap between environmental data and public health decision-making.

Practical collaboration was seen as a vital enabler. Stakeholders recommended initiatives such as joint research programmes, regional surveillance pilots, and cross-sector demonstration projects. These efforts can build shared value while fostering trust and more effective working relationships. For long-term impact, such collaboration should be supported by governance arrangements that clearly define responsibilities and set out how evidence will be used to inform policy and operational decisions.

Another priority raised during the workshop was the integration of AMR indicators from environmental sources, including data from wastewater treatment plants and river systems, into existing public health reporting systems. This step would provide greater visibility of the water sector's role in AMR monitoring and ensure that environmental contributions are fully recognised in national strategies to protect health.

Addressing AMR in a coherent and risk-based way will rely on building stronger links across this wider stakeholder landscape. AMR is increasingly seen as a defining challenge at the intersection of environmental and public health, and progress will require deliberate coordination of scientific insight, operational infrastructure, and regulatory policy. This alignment is essential for an effective national response.

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Water Sector Influence on Tackling AMR

Workshop participants were asked to share their perceptions of the **UK water sector's role in supporting efforts to address antimicrobial resistance (AMR)**, including how the sector contributes to the UK AMR action plan and the extent to which it can enable or facilitate research and monitoring.

There was broad agreement that the water sector has an important role in enabling AMR research, particularly through its extensive infrastructure and access to data. However, it was generally felt that the sector is not currently positioned as a leader in coordinated action on AMR. Some representatives from within the sector emphasised the importance of fulfilling environmental stewardship responsibilities, particularly by minimising the release of antimicrobial resistance genes into receiving waters.

In addition, participants noted a critical knowledge gap around the risks posed to wastewater treatment plant operators and others who may be exposed to untreated sewage. This was seen as an area requiring further investigation to better understand occupational and public health implications.

The discussion identified several strategic areas where the water sector can influence progress and outlined potential methods for supporting and enabling action on AMR. These are summarised below.

Research

- Extensive research into AMR is ongoing across the UK water sector, particularly through university / industry collaborations
- Programmes facilitating doctoral training and knowledge generation on AMR in water systems
- The Welsh Government and UKWIR have funded pilot projects and exploratory studies, though many are short-term and lack sustained surveillance support
- Existing nature-based solutions research do not currently integrate AMR but presents future opportunities

Technology

- Advancements in thermal treatments (e.g. pyrolysis, thermal gasification) are being explored to reduce AMR-related substances in sludge and wastewater
- Emerging technologies include metagenomic sequencing, digital PCR, Resistomap, and in-field sensors for real-time monitoring
- Data-driven innovations such as AI-based analysis, cloud data storage, and geospatial hotspot detection are being considered to accelerate response times

Influence

- Water companies and regulators (Defra, Ofwat, UKHSA, UKWIR) play a central role in AMR research and action planning
- Sectoral influence is fragmented - lack of long-term coordination, consistent funding, and cross-national alignment (e.g. Scotland, Northern Ireland) limits impact
- External influencers include the Home Office, Cabinet Office, CEFAS, and academic institutions. The PATH-SAFE programme exemplifies a large-scale, multi-stakeholder influence platform

Monitoring

Ongoing monitoring programmes include:

- CIP 3/4/5 (gene detection in groundwater, biosolids)
- Environmental surveillance for poliovirus (UKHSA, MHRA & Scottish Gov)
- COVID-19 wastewater surveillance in Scotland
- Home Office campaigns on WBE for drugs and poliovirus
- CDC-led AMR monitoring in aircraft wastewater

- Fragmentated and short-term project scopes remain the key weakness

Policy

- The Cunliffe Review and NEPC's "Testing the Waters" reports have highlighted regulatory gaps and strategic needs for the sector. With potential reform of regulation in the water sector, the is a significant opportunity to influence the future of water quality monitoring.
- International standards groups (ISO, FAO) are working towards method standardisation for wastewater surveillance and monitoring to create standardised approaches.
- Challenges remain in defining AMR thresholds, regulatory targets, and action pathways

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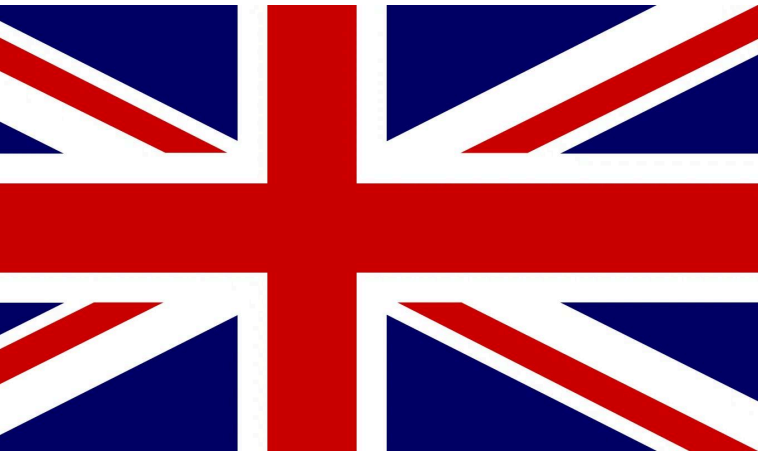
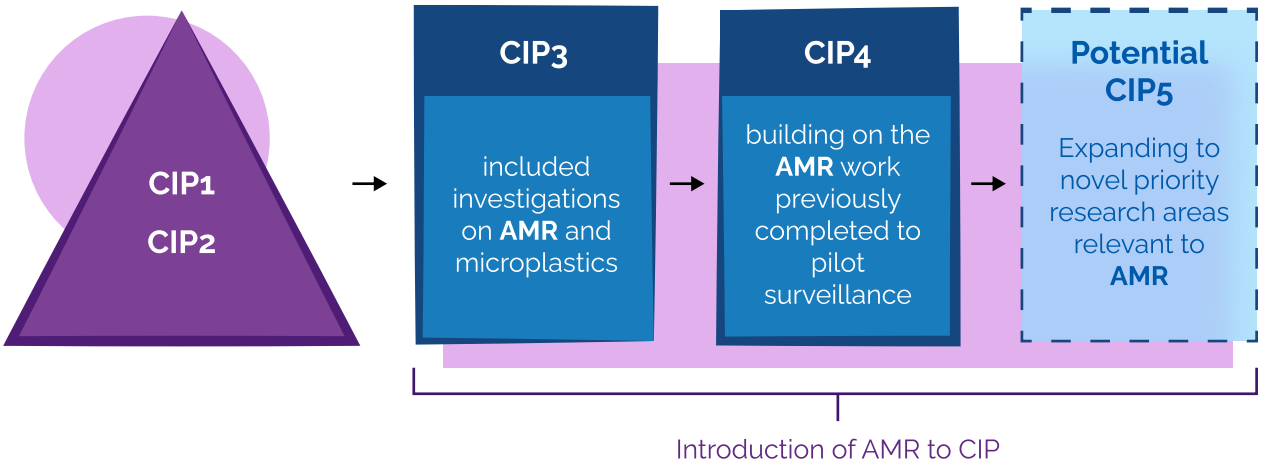
Ongoing Sector Initiatives



The UK water sector is addressing AMR through coordinated initiatives such as the Chemical Investigations Programme (CIP), launched in 2010 to help meet legislative and environmental pressures on trace chemical pollutants, including antimicrobial agents.

Now in its fourth phase, CIP supports water companies in monitoring emerging risks, trialling new technologies, and developing standardised methods, and remains central to AMR research and evidence generation. The workshop has informed discussions the next phase as CIP5's scope, with first proposals for investigations due in September 2025. Alongside CIP, broader research and surveillance programmes, often operating in parallel or collaboration, are essential for a holistic understanding of AMR in the environment.



There are a number of ongoing initiatives in the water sector in addition to CIP which are looking at monitoring and addressing AMR as a contaminant of concern.

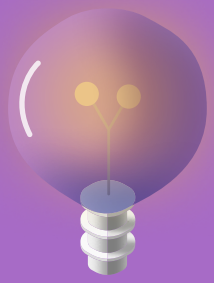
These are outlined on the following page:

Monitoring

Wastewater-based epidemiology programmes using influent to support public health responses, including targeted gene detection trials in CIP3 and CIP4, and participation in the PATH-SAFE programme, which piloted a national surveillance network for foodborne pathogens.

Environmental health monitoring programmes: bathing water and bivalve shellfish quality monitoring.

Hospital wastewater surveillance: e.g. Near-source AMR monitoring at hospital and community sites in Wales.



Innovations

Academic and industry collaboration: including initiatives like RED-ALERT CDT and the Centre for Wastewater-based Epidemiology alongside projects supported by UKWIR.

Next-generation testing methods: metagenomics (short/long read sequencing), AMR source tracking, sweep plate techniques, and host antibiotic profiling.

Digital platforms: combining AMR surveillance data with health outcomes to support decision-making in public health and primary care.

Innovative partnerships: including the development of an integrated One Health surveillance platform across water, health, and agriculture

Methods, Tools and Approaches

Implementation of standardized biosurveillance design models such as the Environmental Biosurveillance Design Framework (EBDF), establishing microbial risk assessment processes, dashboards, and coordination with ISO for method alignment.

Advanced lab techniques: from culturing and sensitivity testing to LC-MS, dPCR/hPCR, and metagenomic analysis.

New research themes: e.g. understanding the role of microplastics as AMR vectors in aquatic systems.

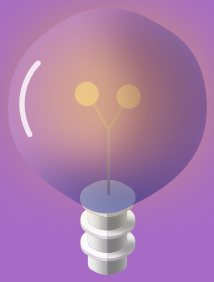
Operational strategies: including influent vs effluent comparisons, combined sewer overflow (CSO) monitoring and harmonised data handling approaches across water utilities.

05

Evolving Opportunities

Monitoring

- Use of tools for One Sample Many Analyses (OSMA) and PFAS source tracking to create potential cross-sector benefits
- Creating an understanding of the water-health interface to inform surveillance and treatment (i.e. the link between hospitals and recreational waters)
- Improve laboratory and in-field testing capabilities using methods using OSMA
- Use hydrodynamic models and geospatial analysis to prioritise high-risk areas for intervention within catchments
- Develop national reporting frameworks to establish a national AMR surveillance strategy
- Launch regional pilots to understand source apportionment and transmission pathways



Innovations

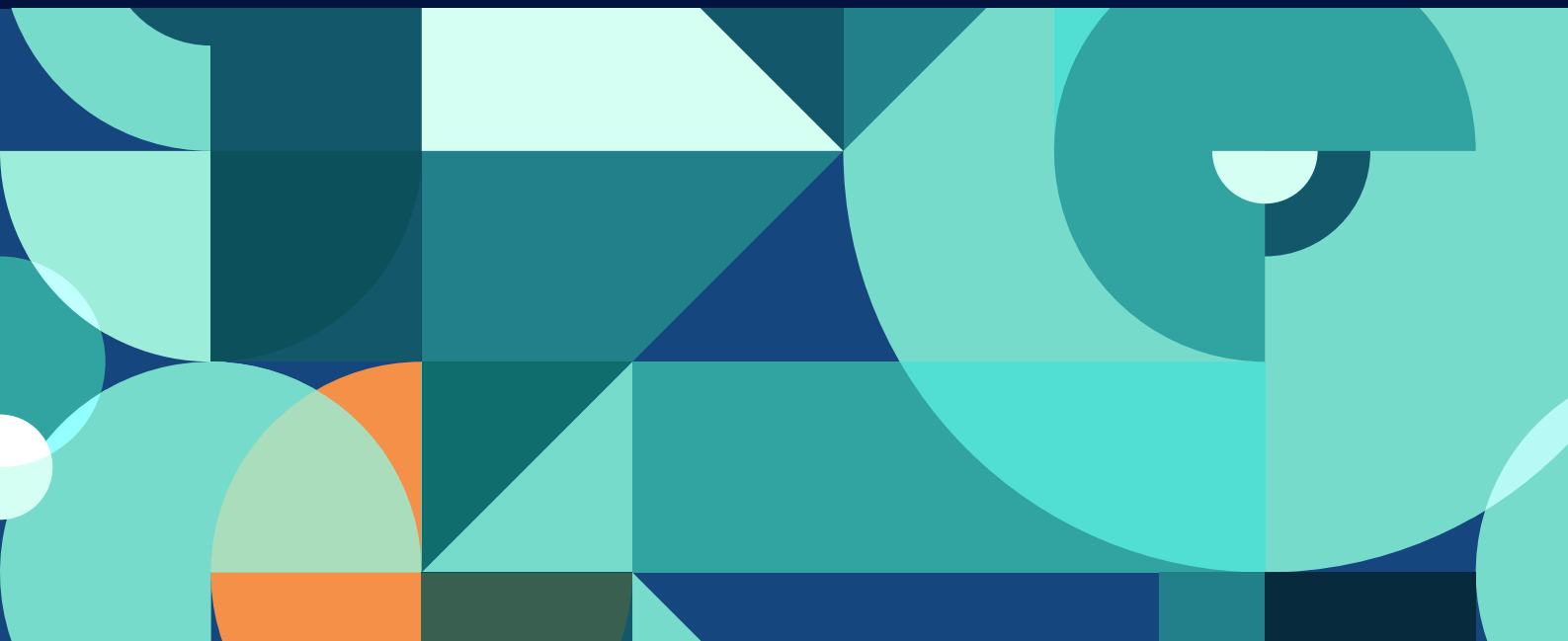
- Cloud-based repositories and metadata frameworks are needed for robust, scalable systems that can share be used for information sharing
- Regulatory drivers are needed to fund innovation mechanisms
- A shift in focus from the health sector to prescribe alternatives to pharmaceuticals (green prescribing)
- AI, big data analytics, and geospatial modelling offer transformative potential for data mining, pattern detection, and strategy development
- Faster surveillance to action cycles are required, which can be streamlined through standardisation of methods and analysis
- Accelerate innovation through funding mechanicals to catalyse cycles of innovation and implementation.

Methods, Tools and Approaches

- Establishing and developing AMR proxies to reduce surveillance costs and increase scalability
- Reform of bathing water and wastewater regulations to include AMR genes and approaches such as Quantitative Microbial Risk Assessments (QMRA)
- Standardisation of regulation and approaches are critical enablers
- Stronger collaboration between the health, agricultural, and pharmaceutical sectors to unlock shared solutions and co-benefits
- Enhanced international cooperation on ISO standards and better integration of the UK four nations for aligned strategy, methods and reporting.

06

Recommendations



Workshop participants were invited to co-develop a set of recommendations across four strategic areas. The exercise aimed to align thinking across sectors and define shared goals. An open forum discussion allowed for consensus-building among the group.

Cross-sector Collaboration & Data Sharing

The opportunity to apply successful models in relation to AMR from the medical, public health, and life sciences sectors to the water sector. **Participants recommended building cross-sector programmes:**

- Developing frameworks for secure, open data sharing between sectors;
- Creating multi-agency advisory groups to guide government decision-making;
- Encouraging joint reporting mechanisms for AMR trends. The aim was to maximise use of public data and promote integrated responses to environmental and public health.

Operational Actions and Monitoring Guidance

Operational recommendations centred on enabling the water sector to better understand and reduce its environmental exposure risk. The group stressed the importance of building capacity through partnerships and creating viable commercial models to support scaled monitoring efforts.

Participants prioritised:

- Establish routine monitoring for high-risk discharge locations in catchments;
- Developing proxy markers to facilitate rapid testing;
- Clearer guidance on what enhanced AMR monitoring would deliver and how that insight could be used operationally.

Policy and Regulation Readiness

Currently, there is no statutory requirement in the UK for water companies to monitor AMR, whether in final effluent or combined sewer overflows. **Recommendations recognised that the UK has an opportunity to shape its own regulatory approach:**

- Explore regulatory drivers for monitoring AMR at high-risk discharge points in line with the Urban Wastewater Treatment Directive in Europe.
- Involving water companies more actively in shaping future regulation through national working groups. These actions would help clarify expectations for the sector and prepare it for future regulatory shifts.

Research Gaps and Future Studies

Addressing key research gaps was seen as essential to underpin effective policy and operations. **The group identified a need to:**

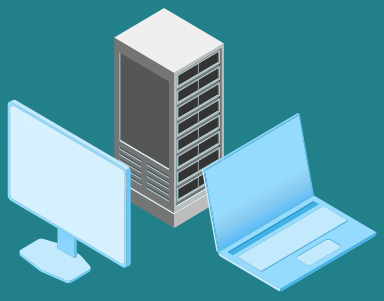
- Improve understanding of environmental and health risks linked to AMR in water;
- Investigate exposure risks for wastewater treatment operators;
- Quantify the benefits of improved treatment processes for AMR removal;
- Develop models to assess and track AMR pathways in the environment.

These future studies would not only help define the problem but also ensure that interventions are targeted, evidence-based, and proportionate.

Operational Actions and Monitoring Guidance

- Enhance monitoring capability or build partnerships to expand testing across the UK water sector further integrating in data from existing pharmaceutical surveillance networks.
- Identify high-risk catchments and locations to understand transmission pathways via pilot studies.
- Identify proxy indicators of AMR genes or chemicals for rapid testing.
- Clearly define the value of enhanced AMR monitoring and ensure intervention routes are in place.
- Establish commercial models for AMR monitoring to reduce costs and maximise stakeholder benefits.
- Identify co-benefits of antibiotic removal through wastewater treatment (e.g. nutrients, heavy metals with).

Cross Sector Collaboration & Data Sharing



- Improve engagement with regulators to measure outcomes
- Integrate the UK water sector with local action on AMR
- Build cross-sector working groups to advise government departments on AMR
- Create frameworks to support AMR data sharing from water into health sectors.
- Create an open access repository for AMR data collected through publicly funded programmes
- Conduct a comprehensive review of user needs for organisations that utilise AMR data for decision-making
- Develop a universally validated national sewage catchment map as a foundation for AMR monitoring infrastructure.

Policy and Regulation Readiness

- Integrate the water sector's role in establishing national AMR surveillance infrastructure.
- Create regulatory drivers for WWTP design and commissioning in high-population urban centres.
- Identify high-risk AMR discharge locations for priority monitoring.
- Involve the water sector in education campaigns on antibiotic use in pharmaceuticals and agriculture.
- Establish industry working groups for the water sector across the four UK nations on emerging contaminants in the water sector.
- Reform bathing water regulations to include AMR genes and antimicrobial chemicals.
- Reform water framework regulations to integrate water quality management policies.
- Review and align the UK to Urban Wastewater Treatment Directive, EU water quality policies.

Research Gaps and Future Studies

- Improve understanding of source control and discharge minimisation from industrial and agricultural sources
- Explore how improved AMR gene and antibiotic removal affects policies like water reuse
- Better understand risks from water and land exposure to AMR-driving chemicals
- Gather more evidence on the effectiveness of treatment processes in removing AMR genes and antibiotics
- Propose a model for effective AMR management in the environment
- Research proxy markers for AMR to reduce routine surveillance costs
- Assess potential AMR risks to wastewater treatment plant operators
- Develop models to measure network impacts and support source apportionment

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Conclusions

Conclusions

The June 2025 stakeholder workshop was the first convening workshop to bring together a range of stakeholders in the UK water sector focused on the sector's role in tackling AMR. It provided a valuable snapshot of the current landscape around AMR and the water sector, capturing a broad range of views across public health, academia, regulation, and water utilities. It reaffirmed AMR as a significant and urgent public health challenge, with increasing recognition of the environmental dimensions particularly through wastewater and sludge transmission pathways, outlining and the water sector's strategic role in mitigation.

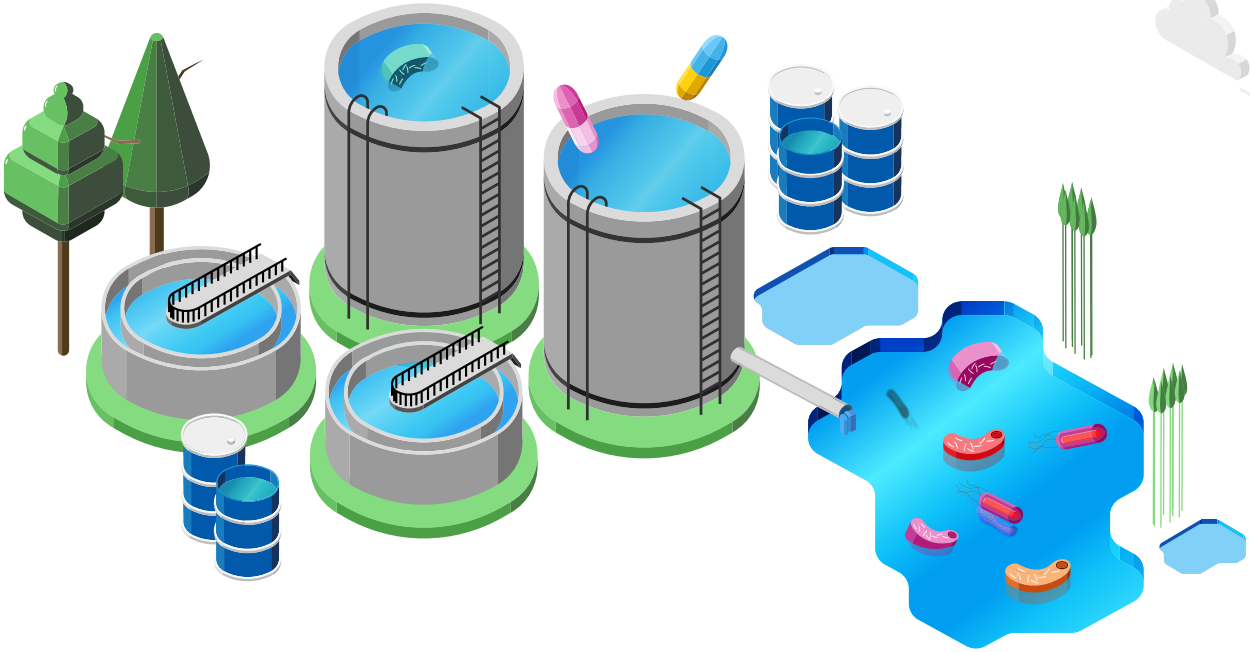
Participants broadly agreed that the water sector holds significant potential to enable AMR research and routine surveillance through its infrastructure and access to data. However, it is not yet widely seen as a leader in AMR responses. Fragmentation across the sector, limited formal coordination with health, veterinary and environmental bodies, and a lack of clear governance structures were identified as key barriers to progress.

There is growing policy momentum to address these gaps. The UK AMR Action Plan (2024–2029) and changes to European legislation both point to an increasing regulatory focus on environmental AMR. Within this context, the water sector has a clear opportunity to take a more proactive role, not just as a downstream recipient of AMR risks, but as a partner in research, innovation, policy and public health protection.

To support this shift, workshop participants developed a set of clear strategic recommendations that reflect shared priorities across the sector.

Key Recommendations

1	Strengthen cross-sector collaboration	Create structured platforms to enable coordination between the water sector, public health, environmental regulators, and academic institutions. This includes regular dialogue, joint priority setting, and collaborative delivery of AMR research and monitoring.
2	Improve data sharing and integration	Facilitate access to and interoperability of environmental and health surveillance data. This includes supporting the integration of wastewater and riverine AMR data into public health reporting systems.
3	Build regulatory and policy readiness	Engage with evolving regulatory frameworks, including updates to the Urban Wastewater Treatment Directive and the UK AMR Action Plan. Water companies and regulators should work together to define their roles in future environmental AMR standards and permitting processes.
4	Support targeted monitoring programmes	Invest in improved detection and quantification of antimicrobial resistance genes in wastewater and receiving waters. Use this data to target capital investment to upgrade treatment technologies and implement good practice measures to minimise environmental release.
5	Address research and evidence gaps	Support pilot studies and long-term research that evaluate AMR exposure risks to workers and communities. Develop standardised methods for environmental AMR monitoring and support the transition from research to implementation.



Thank you for reading.

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