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Antimicrobial resistance among the top 10 threats for global health. Can water utilities help?

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Executive summary

- It has been found that up to 80% of antibiotics consumed by humans are excreted without being metabolised, entering the environment and contributing to the development of resistant bacteria.[1]
- Antimicrobial resistance (AMR) is a process described by the World Health Organisation (WHO) where "bacteria, viruses, fungi and parasites no longer respond to antimicrobial medicines" such as antibiotics, antivirals and antifungals.
- The WHO list AMR among the top 10 threats for global health estimating 10 million lives could be lost globally each year by 2050.[2]
- Wastewater is recognised as a significant contributor to AMR. It serves as a convergence point for various sources, including agricultural run-off, pharmaceutical manufacturing discharge, domestic outflows and hospital effluents, meaning water ends up as the place where antibiotic discharge and microbes gather.
- Can water utilities help? We are committed to exploring this issue further and will continue engaging with water companies. We will also talk with relevant scientific organisations to ensure the adoption of best practice.

"This is an important issue that investors like Royal London Asset Management can have an influence in protecting public health."

Carlota Garcia-Manis, Head of Climate Transition and ESG Engagement

[1] Governing Antimicrobial Resistance (AMR) in a Changing Climate: A Participatory Scenario Planning Approach Applied to Sweden in 2050 - PMC (nih.gov)

[2] Antimicrobial resistance: a global threat | UNEP - UN Environment Programme

Water utilities have the potential to play a key role in decreasing the negative impact linked to antimicrobial resistance.

Antimicrobial resistance (AMR) is a process described by the World Health Organisation where "bacteria, viruses, fungi and parasites no longer respond to antimicrobial medicines" with estimates for 2019 citing 1.27 million deaths were directly attributed to drug-resistant infections globally. This phenomenon poses a grave concern, with the World Health Organisation listing AMR among the top 10 threats for global health estimating that 10 million lives could be lost globally each year by 2050, see Fig 1. World Health Organisations top 10 global health threats.

The urgency of this issue has been recognised for some time, with the UN Environmental Programme's Frontiers report identifying AMR as the most critical emerging environmental pollution problem back in 2017.[3] It is crucial that we address this systemic risk to mitigate its far-reaching consequences.

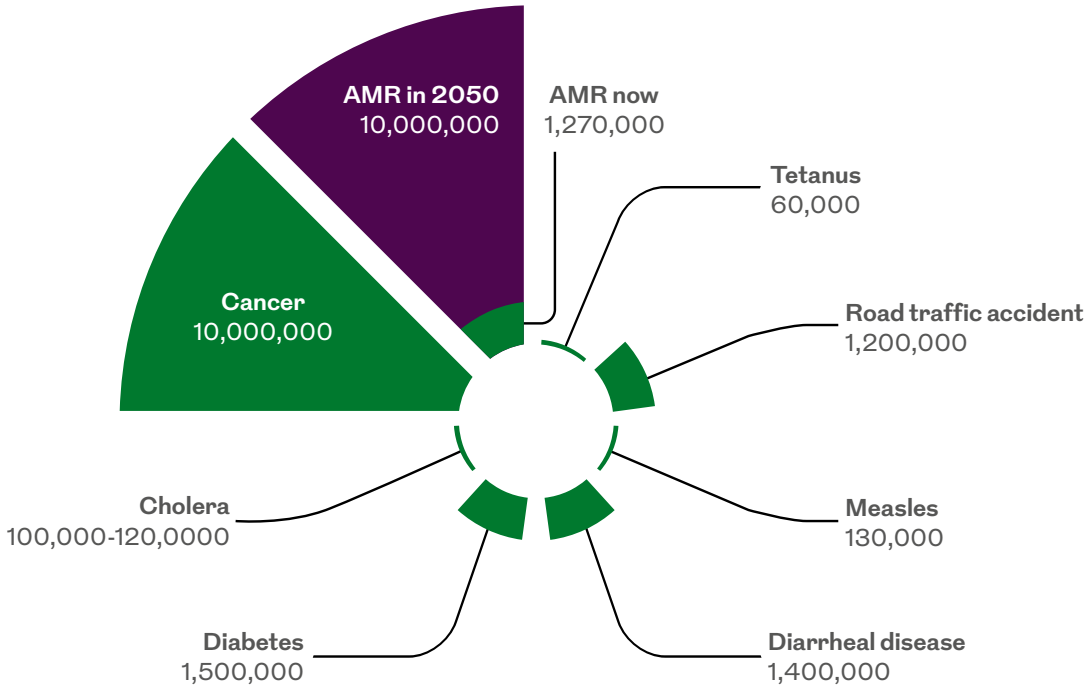
How does AMR happen?

The emergence of AMR is a natural evolutionary process. Resistance can develop through mutations, which are alterations in the DNA sequence,[4] or via horizontal gene transfer, the exchange of genetic material between organisms.[5] Consequently, once a microbe acquires resistance, it has the potential to transmit this trait to other microbes.

Environments that facilitate microbial interaction are particularly conducive to the spread of resistance, increasing the likelihood that pathogens harmful to humans will acquire resistant genes.[6] Furthermore, the presence of chemical pollutants can stimulate bacteria to develop resistance.[7]

AMR is expected to be exacerbated by other problems such as climate change, because climate change consequences such as flooding, and human migration which can cause overcrowding, can amplify AMR transmission, and higher temperatures could cause physiological stress to animals leading to more infectious diseases that require antibiotics.[8]

Fig. 1 World Health Organisations top 10 global health threats



Source: Antimicrobial resistance: a global threat | UNEP - UN Environment Programme. World Health Organisation (WHO). Predicted mortality from AMR compared to common causes of death today (adapted from O'Neill 2016; Murray et al. 2022)

[3] Mapping the evidence for AMR - European Centre for Environment and Human Health | ECEHH
[4] Antibiotic resistance in microbes: History, mechanisms, therapeutic strategies and future prospects - ScienceDirect
[5] Horizontal Gene Transfer - PMC (nih.gov)
[6] Environmental antimicrobial resistance and its drivers: a potential threat to public health - ScienceDirect
[7] PhD Research: Herbicides and antibiotic resistance - European Centre for Environment and Human Health | ECEHH
[8] Governing Antimicrobial Resistance (AMR) in a Changing Climate: A Participatory Scenario Planning Approach Applied to Sweden in 2050 - PMC (nih.gov)

The sectors linked to AMR

Humans and companies have significantly contributed to AMR with several sectors being closely linked to these issues.

- The pharmaceutical sector is very important for AMR not only can drug manufacturers invest money with the aim of discovering new antibiotics, but they can also work to manage and reduce antibiotic discharge[9] and can communicate to individuals how to take antibiotics wisely. This is important – actions such as ensuring that they finish the treatment course means that an individual is much more likely to kill the microbes rather than risking the chance of them becoming immune.[10]
- The farming sector is also crucial, as antibiotics are used in high quantities on crops[11] but are also given regularly to farm animals, not just for the prevention of disease but also for growth promotion and improving feed efficiency.[12]

While pharmaceutical companies and farming are vital parts of combatting AMR, we recognise that the water industry must also play an important role.

How water utilities link to AMR

Wastewater is recognised as a significant contributor to AMR. It serves as a convergence point for various sources, including agricultural run-off, pharmaceutical manufacturing discharge, domestic outflows and hospital effluents, meaning water ends up as the place where antibiotic discharge and microbes gather.[13] This makes water an environment where resistant genes can be transferred between microbes.[14, 15, 16] This can have an important effect on areas adjacent to water treatment plants as wastewater is strongly linked to increased levels of antimicrobial resistance in river bacteria.[17] This connection underscores the importance of addressing wastewater management in our efforts to combat the spread of AMR.

Wastewater treatments plants can contribute to the solution

Wastewater treatment plants can play a pivotal role in mitigating the spread of AMR by serving as an effective barrier that reduces the discharge of antibiotic resistance genes into the environment.[18] Wastewater treatment plants can employ various processes shown below in Fig 2. Types of water treatment processes and their examples.

While wastewater treatment plants have seen technological advancements, historically, these facilities were not specifically designed with AMR in mind.[19]

This is why we have been engaging with water companies, with other like-minded asset owners, to consider AMR as a risk and actively manage this risk by adopting and ensuring effective use of these new technologies.

Did you know?

It has been found that up to 80% of antibiotics consumed by humans are excreted without being metabolised, entering the environment and contributing to the development of resistant bacteria. This issue is becoming more severe as human antibiotic use has increased by 36% in this century, and antibiotic use in livestock is expected to rise by 67% by 2030. Additionally, up to 75% of antibiotics used in aquaculture may be lost into the surrounding environment.[20]

Fig 2. Types of water treatment processes and their examples

Physico-chemical processes	Physical processes	Microbial ecological processes
UV radiation and ionizing radiation	Membrane filters	Using microbes to biodegrade organic pollutants, remove nitrogen and phosphorus, and reduce pathogen loads before discharging the treated water into the environment

Source: Water and sanitation: an essential battlefront in the war on antimicrobial resistance | FEMS Microbiology Ecology | Oxford Academic (oup.com)

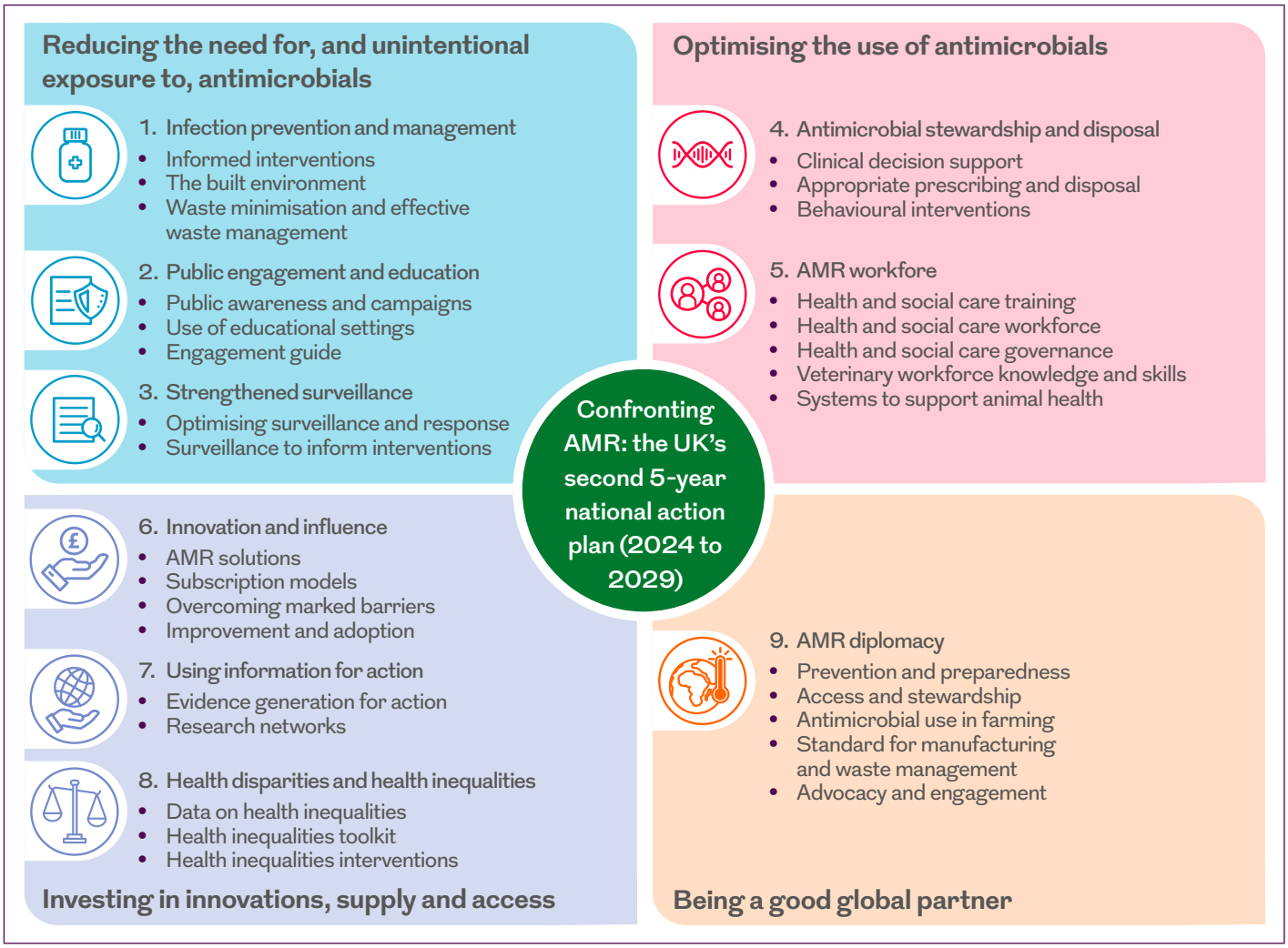
[9] i2023_AMR-Roadmap-Press-Release_FINAL.pdf (ifpma.org)
[10] Pharmacy's role in antimicrobial resistance and stewardship - The Pharmaceutical Journal (pharmaceutical-journal.com)
[11] Board Paper Template 2020 inc checklist (food.gov.uk)
[12] Antimicrobial resistance in humans, livestock and the wider environment - PMC (nih.gov)
[13] Contribution of wastewater to antimicrobial resistance: A review article - ScienceDirect
[14] Contribution of wastewater to antimicrobial resistance: A review article - ScienceDirect
[15] Methods matter: What steps are companies taking to help curb AMR by manufacturing responsibly? | Access to Medicine Foundation
[16] Environmental antimicrobial resistance and its drivers: a potential threat to public health - ScienceDirect
[17] Is antimicrobial resistance in rivers a public health risk? - European Centre for Environment and Human Health | ECEHH
[18] Removal of antibiotic resistance genes (ARGs) in various wastewater treatment processes: An overview: Critical Reviews in Environmental Science and Technology: Vol 52 , No 4 - Get Access (tandfonline.com)
[19] Water and sanitation: an essential battlefront in the war on antimicrobial resistance | FEMS Microbiology Ecology | Oxford Academic (oup.com)
[20] Governing Antimicrobial Resistance (AMR) in a Changing Climate: A Participatory Scenario Planning Approach Applied to Sweden in 2050 - PMC (nih.gov)

Regulation and policy interventions

Back in 2015, Member States of the World Health Organisation, Food and Agriculture Organisation and the World Organisation for Animal Health endorsed a shared Global Action Plan on Antimicrobial Resistance. In 2016, there was increased political focus on this issue with 193 Heads of State declaring that they were committed to supporting and implementing the plan at national, regional and global levels.[21]

Following this, within the UK specifically, there was an AMR strategy for the years 2013 to 2018 which focused more on AMR research and distribution.[21] In 2019, this was improved upon by the UK government publishing its 20-year vision for AMR, see Fig. 3 Summary of the UK Government's national action plan. This set the goal of ensuring AMR will be controlled and contained by 2040. To deliver on this vision, the government committed to producing a series of five-year national action plans.[22]

Fig. 3 Summary of the UK Government's national action plan



Source: Confronting antimicrobial resistance 2024 to 2029 - GOV.UK (www.gov.uk)

Within the five-year national action plan, clean water was described as 'critical for reducing the spread of infectious diseases and AMR in people, animals and the environment.' The presence of bacteria and antimicrobials in sewage is a major concern because of the potential release into surface waters, groundwater, onto land and into the air. Similarly, contaminated drinking water presents a worrying risk for both infection and resistance.[23]

Within the 20-year vision for AMR, nine ambitions were set out, including ambition six which is 'minimising environmental spread.' This goal mentions water utilities by stating that they want to promote 'effective waste and wastewater treatment and handling'.[24]

[21] Contained and controlled: the UK's 20-year vision for antimicrobial resistance (publishing.service.gov.uk)
[22] Contained and controlled: the UK's 20-year vision for antimicrobial resistance (publishing.service.gov.uk)
[23] Tackling antimicrobial resistance 2019 to 2024 (publishing.service.gov.uk)
[24] Contained and controlled: the UK's 20-year vision for antimicrobial resistance (publishing.service.gov.uk)

Looking forward

AMR is a topic that is increasingly recognised as a significant threat to public health. As we further our understanding of this systemic risk, we acknowledge that its impact extends beyond water companies. We have started by engaging on this and other adjacent issues with the water industry.

We believe that it is imperative to consider related concerns, such as the reduction of plastic usage, because they are hypothesised to act as potential hotspots for AMR.[25] We are committed to further exploring this issue and to continue engaging with water companies and talking to relevant scientific organisations to ensure the adoption of best practice.

Investor Action on AMR (IAAMR)

Royal London Asset Management is pleased to have signed the Investor Action on AMR (IAAMR)'s Public Investor Statement, which calls for global action to combat DrugResistance.

The IAAMR initiative, founded by the FAIRR Initiative, the Access to Medicine Foundation, and the UK Department for Health and Social Care, has launched the Statement to urge world leaders and policymakers to intensify efforts, coordinate action, and reaffirm commitments to tackle AMR. This comes in advance of the UN General Assembly High-Level Meeting on AMR in September 2024.

Sign the Statement here

Read the statement and find out more about IAAMR

[25]PhD Research: Microplastics as Vectors of Antimicrobial Resistance in Aquatic Systems - European Centre for Environment and Human Health | ECEHH

Investment risks

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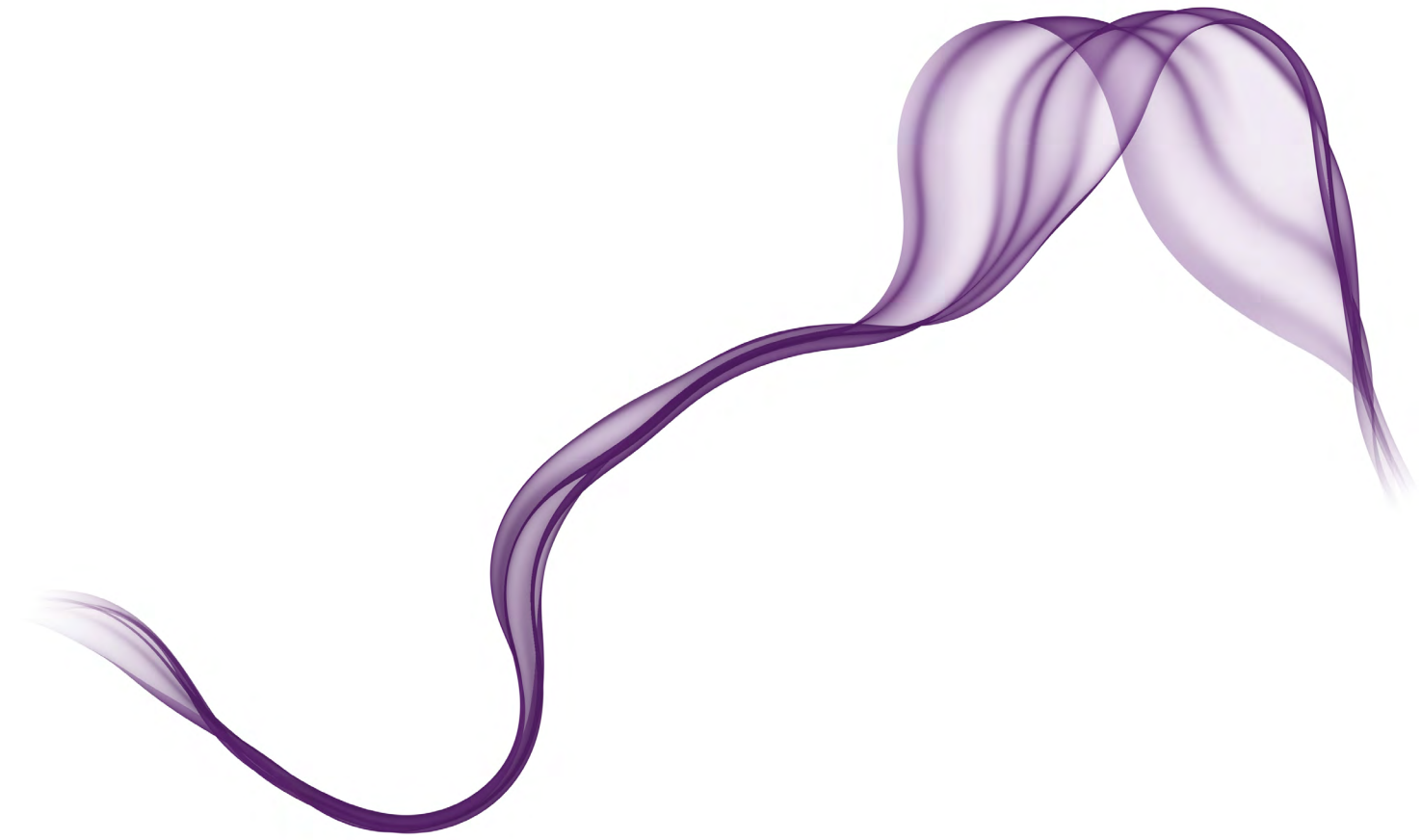

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