European Bank
for Reconstruction and Development

EBRD engagement in global efforts to curb antimicrobial resistance (AMR)

June 2026

Acknowledgements and disclaimer: This report was written by Nobuko Ichikawa and Adonai Herrera-Martínez. The findings, interpretations and conclusions expressed in this work are those of the authors alone and do not necessarily reflect the views of the European Bank for Reconstruction and Development. Figures will need to be updated over time, as research work on antimicrobial resistance is progressing at a rapid pace. The report does not cover issues such as diagnostics and surveillance due to time limitations. The report benefited from reviews by Matthias Loening, Noriko Kitamura, David Jenkins, Debbie Cousins, Alexander Plekhanov, Stanislav Suprunenko, Martin McKee, Michael Corley, David Tyler, Elizabeth Tayler, Michael Sharland and Clare Chandler. The EBRD's AMR engagement is a result of the combined efforts of different teams and departments, including the Environment and Sustainability Department, Manufacturing and Services, Agribusiness, Infrastructure, Transition Impact, Global Economics, Project Preparation and Implementation, Corporate Debt Banking Portfolio, Procurement Operations and Delivery, and the Communications Department. The report is a result of the Bank's close collaboration with clients, industry, investors, medical professionals, academia, research institutions, the World Health Organization, the World Bank, the International Finance Corporation, the Asian Development Bank, the Asian Infrastructure Investment Bank, Germany's KfW Development Bank, the Organisation for Economic Co-operation and Development, the UK Department of Health and Social Care, and civil society organisations.

Contents

Foreword

The World Health Organization (WHO) considers antimicrobial resistance (AMR) to be a vital global health issue[1] that poses a critical threat to modern health systems, food security and economic sustainability. At the High-Level Meeting on Antimicrobial Resistance that took place in the context of the United Nations General Assembly in September 2024, global leaders committed to a set of targets and actions to curb AMR, including a 10 per cent reduction by 2030 in the estimated 5 million human deaths annually associated with bacterial AMR. The European Bank for Reconstruction and Development (EBRD) is committed to supporting these goals. We have driven AMR engagement since 2016 by fostering cooperation between different Bank teams and working closely with external stakeholders – from clients and industry to investors, governments, other international organisations and civil society – to generate synergies and produce effective outcomes. This report takes stock of that engagement, seeking to contribute to the fifth High-Level Ministerial Conference on AMR, taking place in Abuja, Nigeria, in June 2026, which will serve as a global platform for high-level dialogue and turn political commitments into actionable strategies.

The Bank has undertaken AMR risk management capacity-building technical cooperation programmes for healthcare service, public-private partnership (PPP) hospital, national Covid-19 response, pharmaceutical and agribusiness projects in Egypt, Georgia, Kazakhstan, Türkiye and Ukraine and across the EBRD regions. It has hosted five international AMR symposiums, with keynote speakers including Professor Dame Sally Davies, the United Kingdom's Special Envoy on AMR. We have engaged with experts from academia, research organisations, industry, philanthropic organisations, civil society, the WHO, the Organisation for Economic Co-operation and Development (OECD) and the World Bank. In addition, World AMR Awareness Week (WAAW) is marked every November by a staff campaign to increase AMR awareness in the EBRD community.

The EBRD will continue to engage on AMR at this critical global political juncture to address the urgency of the AMR challenge and to implement effective interventions based on a cross-sectoral and cross-discipline One Health approach.[2] It is imperative that we pool our efforts to prevent the proliferation of AMR and safeguard our families and communities.

Fatoumata Bouaré
Vice President, Chief Risk Officer

1 See WHO (2023b).

2 The WHO defines One Health as "an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent". See WHO (n.d.).

Executive summary

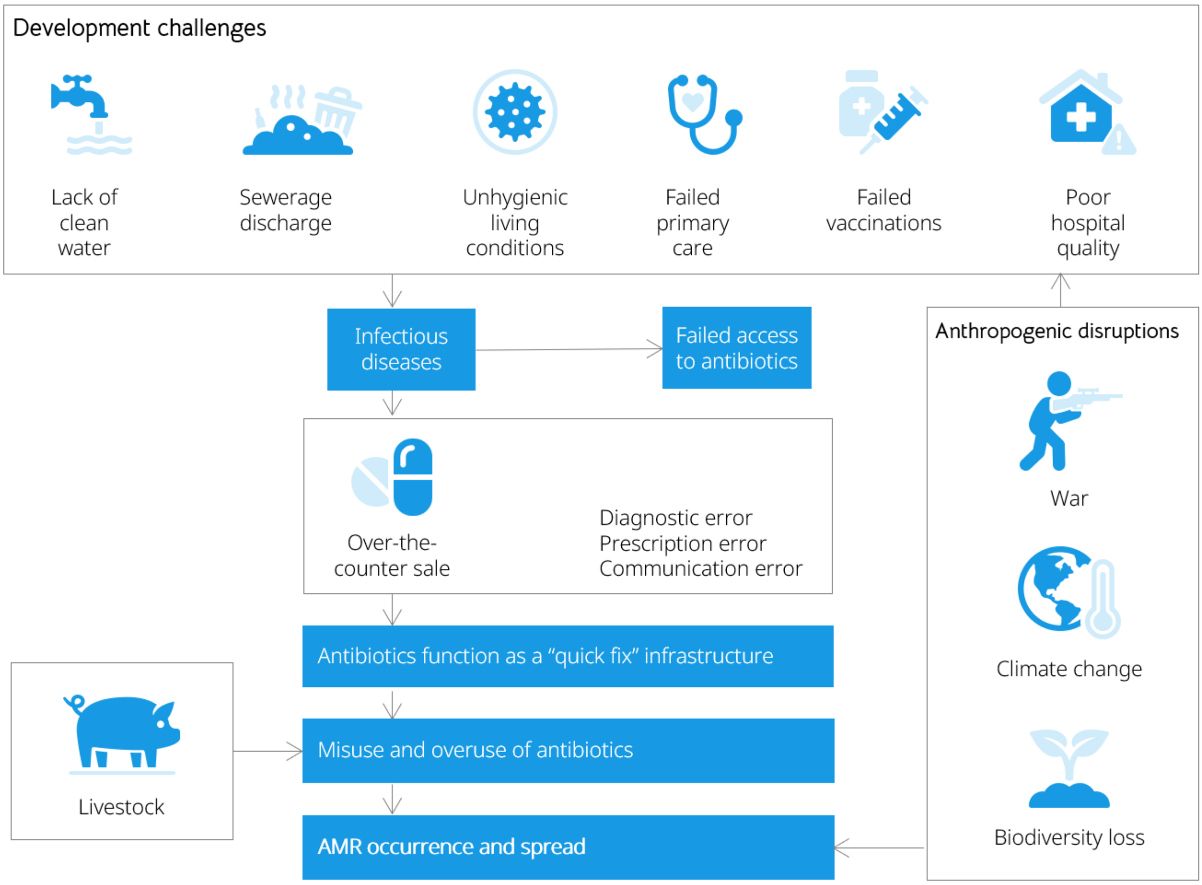
This report takes stock of what the EBRD, as a multilateral development bank (MDB), has done to address AMR. It also outlines proposals to scale up the Bank's AMR engagement with stakeholders and the regions in which the EBRD operates and invests. The occurrence and spread of AMR are primarily accelerated by the misuse and overuse of antimicrobials, as well as by development challenges and anthropological disruptions. AMR is already having a significant impact on human, animal, plant and ecosystem health. It is incurring economic costs in the form of increased healthcare spending, lost productivity and a deterioration in food safety and security. In the same way that Covid-19 spread rapidly around the globe, the global connectivity of travel and trade exposes the whole world to the risk of AMR. Furthermore, the impact of AMR is disproportionately borne by low- and middle-income countries (LMICs) and war-torn territories. AMR was directly responsible for killing 1.3 million people in 2019,[3] and it is estimated that almost 38 million people could die from drug-resistant bacterial infections between now and 2050.[4] AMR is an existential threat to humanity, together with climate change, biodiversity loss and environmental pollution.

The Bank recognises AMR as a significant challenge for the regions in which it operates, in terms of both addressing the Sustainable Development Goals (SDGs) and countering environmental and sustainability risks to its investments. In accordance with its Environmental and Social Policy, which includes AMR risk management provisions, the Bank has been working to tackle AMR. It has also explored related opportunities in sectors such as healthcare, PPP hospital infrastructure, agribusiness and water. International and national efforts are under way to prevent AMR and its proliferation. MDBs, such as the EBRD, can play a key role in this sphere by using their investment capacity, as well as their experience, knowledge and networks with industry, governments and civil society, to respond to the urgency of the AMR challenge. To this end, the Bank is keen to further facilitate cooperation and collaboration with stakeholders for a systematic One Health approach to mitigating AMR risk and building resilient sustainable economies.

3 See Antimicrobial Resistance Collaborators (2022).

4 See GBD 2021 Antimicrobial Resistance Collaborators (2024).

Figure 1. The AMR burden is disproportionately heavy in LMICs



Source: Alina Almakky, University of Bath.

1. What is AMR?

Antimicrobials are used to protect human, animal and plant health from pathogenic microbes. AMR occurs when bacteria, viruses, fungi and parasites no longer respond to antimicrobial medicines. As a result, antibiotics and other antimicrobial medicines become less effective or completely ineffective in treating infections, increasing the risk of disease spread, severe illness, disability and death. AMR is a natural process that happens over time through genetic changes in pathogens. Its emergence and spread are accelerated by human activity – mainly the misuse and overuse of antimicrobials to treat, prevent or control infections in humans, animals and plants.[5]

5 See WHO (2023b).

2. Antimicrobials as critical social infrastructure

Antimicrobials, particularly antibiotics, save lives from infectious diseases and are estimated to add an average 20 years to life expectancy around the globe.[6] Antimicrobials are a foundation of modern medicine and have become a critical part of the infrastructure of modern society, as well as a global public good.[7] It is estimated that a total of 5 million global deaths were associated with AMR in 2019, including some 1.3 million deaths that were directly attributable to bacterial AMR, exceeding the number of people who died from HIV/AIDS or malaria.[8] This is a stark reminder of the efficacy of current antibiotics. In the 2019 Global Burden of Disease (GBD) study, AMR was the third-highest underlying cause of death behind ischaemic heart disease and stroke.[9] According to the study, between now and 2050, almost 38 million people could die from drug resistance. By 2050, the annual numbers of deaths attributable to and associated with AMR could rise to 1.9 million and 8.2 million, respectively. The number of deaths directly attributable to AMR bacterial infection is expected to increase by 70 per cent between 2021 and 2046.[10] AMR could reduce life expectancy globally by 1.8 years over the next decade without proper action.[11] The "Grand Pandemic" is here.[12]

Meanwhile, no new classes of antibiotic have been discovered since the 1980s. Discovering and developing new antibiotics is challenging. It can take over 15 years and cost more than US$ 1 billion to bring a new antibiotic to market. Many major manufacturers have pulled out of antibiotic development, while some have even gone bankrupt. In the 1980s, there were 18 multinational companies committed to antibiotic research; today, there are only a handful.[13] This is because a volume-based model that supplies a large quantity at a lower price does not preserve the efficacy of precious new antibiotics, while a value-based model that provides a small quantity at a higher price does not ensure equitable and secure access to drugs for patients when they need them. The market-based system does not function for manufacturers of new antibiotics.

Global health officials are concerned that the lack of new antibiotics will exacerbate the rise in AMR.[14] To tackle this market failure, organisations such as the Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator (CARB-X) and the Global Antibiotic Research & Development Partnership (GARDP) are offering "push" incentives to support innovation and development from the early stages by lowering developers' costs and risks with financial support. Meanwhile, the United Kingdom has adopted a new "pull" payment model to reward makers of new antibiotics that have successfully proven their drugs' scientific value, viability and market relevance by awarding them government procurement contracts. Similar efforts are ongoing in Sweden, Germany and the United States of America. These programmes aim to incentivise research and innovation in the antibiotic sector by providing a guaranteed financial return and de-linking price from volume.

As seen above, the response to the growing AMR crisis has focused mainly on trying to outpace drug-resistant bacteria through the development of new antibiotics.[15] However, "Reserve" antibiotics as defined by the WHO's AWaRe system (including new antibiotics) currently make up less than 0.1 per cent of the total global volume of antibiotics.[16] Preventing infectious diseases and preserving the efficacy of existing antimicrobial medicines are urgent tasks. People die from a lack of timely access to antibiotics. Globally, there are 5.7 million deaths per year from treatable bacterial infections, exceeding the number of people dying from AMR infections.[17] The majority of deaths from treatable bacterial infections occur in LMICs, so interventions to

6 See Hutchings, Truman and Wilkinson (2019).
7 See World Bank (2024).
8 See Antimicrobial Resistance Collaborators (2022).
9 See World Bank (2024).
10 See GBD 2021 Antimicrobial Resistance Collaborators (2024).
11 See Global Leaders Group on Antimicrobial Resistance (2024).
12 Ibid.
13 See Wellcome (2023).
14 See Janković (2024).
15 See Balasegaram (2023).
16 See Kizito et al. (2025).
17 See CDDEP (2019).

ensure access to antibiotics are essential in these countries (see the discussion on Africa in Section 12).

Furthermore, shortages of existing essential antibiotics are becoming increasingly common worldwide.[18] Such shortages risk hindering efforts to combat the emergence and spread of AMR and, more importantly, risk hindering access to effective therapies: shortages of first-line antibiotics often lead to overuse of specialist antibiotics that are kept in reserve for emergencies. Not only are these substitutes potentially less effective, but reliance on them increases the risk of AMR developing and infections becoming more difficult to treat in the long run.[19] In the United States, for example, antibiotics were 42 per cent more likely to be subject to shortages than the average drug product in 2022.[20] The US Food and Drug Administration (FDA) indicates that shortages are linked to economic forces such as a lack of incentives to produce less profitable drugs (such as generic antibiotics) and a lack of reward for high-quality manufacturing, as well as logistical and regulatory challenges posed by complex and fragmented global supply chains.[21] More than two-thirds of all antibiotics used globally by humans are estimated to be generic,[22, 23] so the economic forces embedded in the production of generic antibiotics have a significant impact on health security. There is currently no universal consensus regarding a policy or strategy for forecasting or managing shortages.[24] However, national regulatory authorities, particularly in high-income countries, are becoming increasingly involved in efforts to anticipate and mitigate antibiotic shortages.[25] The EU, for example, has taken steps under the proposed Critical Medicines Act[26] to improve the availability, supply and production of essential medicines such as existing antibiotics (see Section 10).

18 See Shafiq et al. (2021).

19 See Balasegaram (2023).

20 See USP (2022).

21 See FDA (2019).

22 See Gauzit and Lakdhari (2012).

23 See Grand View Research (2025).

24 See Shafiq et al. (2021).

25 See WHO and GARDP (2024).

26 See https://health.ec.europa.eu/medicinal-products/legal-framework-governing-medicinal-products-human-use-eu/critical-medicines-act_en.

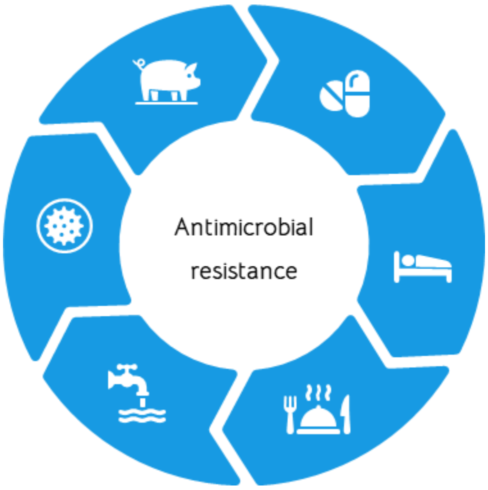
3. AMR and One Health

More than half of global antibiotic use is for animal protein production, largely as a growth-promotion agent, but also for the prophylaxis and metaphylaxis of infection, often as a less costly alternative in the absence of biosecurity and biosafety, animal welfare and nutrition management to safeguard animal health.[27] The use of antibiotics is expected to grow rapidly in LMICs in tandem with increasing income and demand for animal protein.[28] Intensive use of antibiotics in food animals increases the risk of AMR occurring in these animals (see Section 4). Moreover, antibiotics used in humans and animals are reaching the environment through urine and excreta. Between 40 per cent and 90 per cent of a given antibiotic dose is excreted as metabolites that retain antimicrobial activity, eventually reaching the environment, contaminating soil, water and vegetation.[29] Wastewater treatment plants, hospitals and livestock farms can be sources of contamination in the form of active antibiotic ingredients, AMR bacteria and genes, inducing AMR (see Section 9 for more on pharmaceutical manufacturing waste standards and Section 10 for the European Union (EU) approach to wastewater treatment plant monitoring of AMR).[30]

In addition, on a worldwide scale, up to 39 countries have been found to use antibiotics to treat or prevent infections caused by plant pathogenic bacteria,[31] which are responsible for various plant diseases.[32] While data are limited, antibiotics are reportedly recommended far more frequently and for a much greater variety of crops than previously thought. Relative to human and animal use, the quantities of antibiotics used for crops globally are comparatively small, but this does create some unique avenues through which resistance can develop in human pathogens.[33] The agricultural use of antifungal compounds that have high human medicine value is another concern.[34]

The environment is considered a reservoir of AMR bacteria and a pathway for AMR genes to transfer horizontally to other bacteria. Other contaminants, such as biocides and heavy metals in the environment, can act as a stressor for AMR occurrence.[35] The use of antimicrobials, such as antibiotics, in humans, animals and plants and their contamination of the environment need to be understood in the context of a One Health integrated and multidisciplinary approach, which aims to sustainably balance and optimise the health of people, animals, plants and ecosystems (see footnote 2).

Figure 2. One Health



Source: Kensuke Matsueda, UN-HABITAT Afghanistan office.

27 See Ritchie (2017).

28 See Mulchandani et al. (2023).

29 See Polianciuc et al. (2020).

30 See Han et al. (2023).

31 See European Food Safety Authority (2024).

32 See Gautam and Kumar (2020).

33 See Taylor and Reeder (2020).

34 See Fisher et al. (2022).

35 See Samreen, Malak and Abulreesh (2021).

4. The cost of AMR

In 2017, a World Bank report estimated that global annual gross domestic product (GDP) could fall by 1.1 per cent by 2050 relative to a base-case scenario with no AMR effects, while in a high-impact AMR scenario, the loss could be as much as 3.8 per cent. Under that high-impact scenario, an additional 24 million people would be forced into extreme poverty by 2030, mostly in low-income countries. This would make SDG 1, to eliminate poverty by 2030, harder to reach.[36] According to the most recent research funded by the United Kingdom (2024), conducted by the World Organisation for Animal Health (WOAH) and the World Bank, in a scenario of failing to contain drug resistance, there could be a staggering US$ 1.7 trillion annual reduction in global economic output by 2050, amounting to a 0.9 per cent decrease in GDP due to the economic impacts of AMR in humans.[37]

A 2024 United Nations report said countries were "severely off track" to meet the SDGs, with only 15 per cent of SDGs currently likely to be achieved.[38] Globally, the extreme poverty rate increased in 2020 for the first time in decades, setting back progress by three years. Since then, the recovery has been uneven, with low-income countries lagging. The prolonged impact of Covid-19, compounded by conflict, climate change and economic turmoil, continues to pose interrelated challenges when it comes to achieving the SDGs. AMR is an additional burden.[39]

The World Bank's 2017 report also estimated that global livestock production could decline by 2.6-7.5 per cent per year – and by 11 per cent in LMICs – by 2050 due to AMR.[40] The aforementioned 2024 research by the WOAH and the World Bank estimates that annual livestock production losses due to AMR will equal the consumption needs of 746 million people by 2050 and, under a more pessimistic assumption, as many as 2 billion people globally.[41]

According to a recent report by the Global Leaders Group (GLG) on AMR,[42] the larger AMR impact on LMIC livestock production is due to the heavier burden of animal disease and limited access to preventative measures such as vaccines, leading to an overdependency on increasingly ineffective antimicrobials to control animal diseases.[43] With more than 1.3 billion people relying on livestock for their livelihoods and over 20 million people depending on aquaculture,[44] there is an urgent need to prioritise actions and policies targeting AMR in animals, such as herd and health management (for example, biosecurity, biosafety, animal welfare, feed management and so on).

The same GLG report warns that: (i) AMR's human and economic impacts are already staggering and will grow exponentially, particularly in LMICs, without a much more robust global response; (ii) AMR could reduce life expectancy globally by 1.8 years over the next decade (as mentioned in Section 2); (iii) AMR is expected to lead to far greater healthcare expenditures, with total expenses to treat resistant bacterial infections alone reaching US$ 412 billion annually by 2035; and (iv) increased morbidity and mortality from these infections will lead to lower workforce participation and productivity losses of US$ 443 billion per year.

The cost of AMR is also significant in high-income countries, where more data are available. A 2023 OECD report shows that the cost of treating complications due to AMR infections is close to US$ 30 billion annually, adjusting for purchasing power parity, across 34 OECD and EU/European Economic Area (EEA) countries.[45] For comparison, across 17 countries where data are available, the total health expenditure incurred each year due to AMR is almost 20 per cent of all health expenditure for treating Covid-19 patients in 2020. This means that the cost of treating AMR patients for five years is roughly equivalent to that of treating all Covid-19 patients in 2020 alone.[46]

The OECD report also suggested that scaling up investments in One Health packages of actions against

36 See Jonas et al. (2017).
37 See WOAH and World Bank (2024).
38 See United Nations Statistics Division (2024).
39 Ibid.
40 See Jonas et al. (2017).
41 See WOAH and World Bank (2024).
42 See Global Leaders Group on Antimicrobial Resistance (n.d.).
43 See Global Leaders Group on Antimicrobial Resistance (2024).
44 See FAO (2022).
45 See OECD (2023).
46 See OECD (2023).

AMR – human health interventions in relation to antimicrobial stewardship (AMS), better environmental and hand hygiene in healthcare settings and better food safety practices and biosecurity on farms – in the EU/EEA and OECD countries could generate a significantly greater return than the cost of implementation. Every US$ 1 generates the equivalent of US$ 5 in economic benefits through reductions in health expenditure and increased productivity at work.[47]

The GLG report, meanwhile, states that if a package of AMR interventions it recommends were implemented globally, it would be likely to cost an average of US$ 46 billion per year and yield a return of US$ 7-13 for every US$ 1 spent by 2050. This makes a compelling global economic case for sustainable investment in AMR response.

47 Ibid.

5. Why does the EBRD engage on AMR?

The Bank supports the economies in which it operates in attaining the SDGs through investment projects, technical cooperation and policy dialogue. The Bank identifies AMR as an obstacle to national achievement of the SDGs, as well as an environmental and sustainability risk to its investments. Where appropriate, it also explores proactive opportunities to prevent AMR and its proliferation. The EBRD's transition impact, a key principle governing its operations, incorporates AMR risk management as an important part of its impact mandate under the "well governed" quality of a sustainable market economy in healthcare and livestock production (see Section 6 for more on the transition impact of AMR).

Furthermore, the Bank is investing in the healthcare services, hospital infrastructure, pharmaceutical, agribusiness and water sectors. Projects in these sectors come up against AMR risks and opportunities where effective entry points can be identified under a One Health approach. All of the EBRD's investee economies have developed national action plans (NAPs) on AMR. However, they face the common challenges of insufficient institutional capacity, funding and prioritisation. The Bank, therefore, has a unique opportunity to make a difference on AMR through a private sector-focused approach, complementing the approaches of other international organisations, who mainly have a mandate to work with governments and grants.

Many of the economies in which the EBRD works are significantly affected by AMR. While data are scarce in low-income countries, with microbiology laboratory capacity limited or entirely lacking, sub-Saharan Africa, into which the Bank is expanding, is estimated to be one of the regions most severely affected by AMR (see Figure 3). The number of children under five dying from drug-resistant infections is on the decline globally, including in sub-Saharan Africa.[48] Children in sub-Saharan Africa, however, are still 58 times more likely to die from AMR than children in high-income countries.[49]

It is estimated that 133,000 deaths were directly attributable to bacterial AMR in the WHO European region in 2019, with a further 541,000 deaths associated with AMR. (This is one of the seven Global Burden of Disease regions and includes all of the EBRD's central and eastern European, central Asian and Baltic economies, Georgia, Azerbaijan, Armenia, Türkiye, Cyprus and Greece.)[50] The high levels of resistance of several significant bacterial pathogens, together with the high mortality rates associated with infections due to these pathogens, demonstrate that AMR is a serious threat to public health in the WHO European region.[51] Here, a notable resistance gradient emerges, with a clear pattern from north to south and west to east. The northern and western regions predominantly show lower resistance rates, while the eastern and southern regions tend to show higher rates.[52] This indicates that the regions in which the EBRD operates have a higher burden of AMR.

48 See GBD 2021 Antimicrobial Resistance Collaborators (2024).

49 See McDonnell and Klemperer (2022).

50 See European Antimicrobial Resistance Collaborators (2022).

51 See McDonnell and Klemperer (2022).

52 See ECDC and WHO European Region (2023).

Case study: The impact of conflict

Conflicts and wars in the regions where the EBRD operates deprive people of access to clean water, nutrition, hygiene, energy, housing and medical services, such as child vaccination and maternity care, among other things. Attacks on healthcare workers in conflict areas worsen conditions even further.[53] The provision of healthcare services with access to essential medicines such as antibiotics, a good standard of infection prevention and control (IPC) and robust AMS has become difficult. Serious war-related injuries and diseases exacerbate the situation. While reliable data on infections following war wounds in the current conflict in Ukraine are unavailable, the prevalence of war wounds and AMR have been studied over the past two decades (together with conflict-driven environmental contamination by heavy metals from expended munitions, which may co-select for both metal and antibiotic resistance).[54] Since March 2022, the European Centre for Disease Prevention and Control (ECDC) has advised that the treatment of traumatic wounds in Ukraine may be made more challenging by multidrug-resistant bacteria.[55]

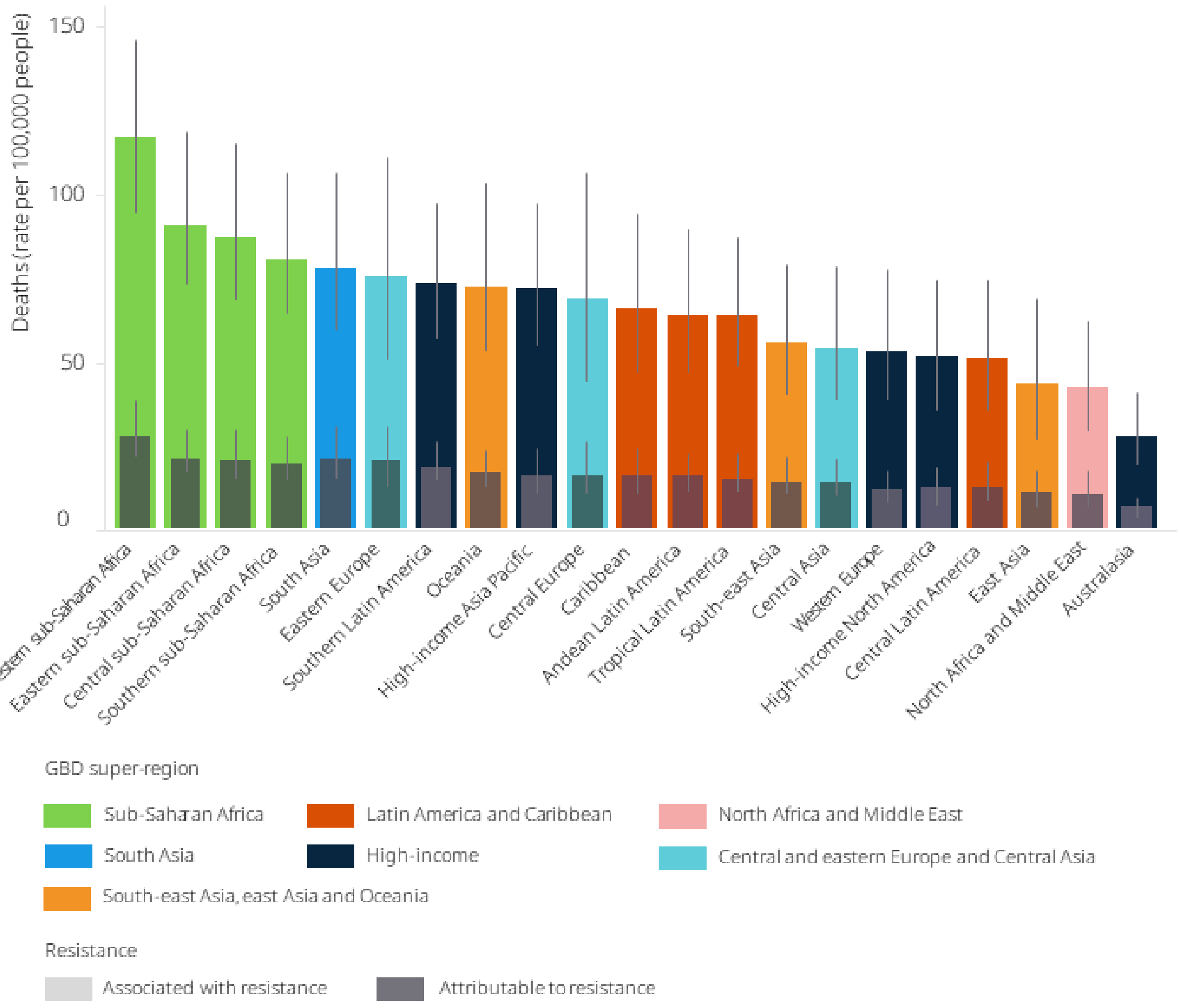
In June 2022, screening for multidrug-resistant, Gram-negative bacteria – the world's most significant public health problem due to their high resistance to antibiotics[56] – was carried out in 103 Ukrainian patients admitted to University Hospital Frankfurt, Germany. It found 34 multidrug-resistant, Gram-negative isolates in 17 (17 per cent) of the 103 patients.

Ukraine's devastated infrastructure and disrupted essential services, compounded by war injuries, are creating the conditions for increased incidence of AMR.[57] A recent molecular analysis of Gram-negative bacterial isolates from injured Ukrainian service members identified multiple resistance genes, including genes capable of conferring resistance to cefiderocol, a recently licensed antibiotic for use on carbapenem-resistant bacteria, which is not officially available in Ukraine.[58] War-related infections and AMR could have a drastic impact on the health of people inside and outside the country, creating a vast reservoir of multidrug-resistant, Gram-negative infections in Ukraine and Russia, with the potential for further spread.[59] A similarly devastating situation in Gaza is creating a high risk of AMR occurrence among the population and beyond.[60]

Experts recommend the following in Ukraine: strong IPC and AMS leadership, strict adherence to basic precautions and the development of standardised, context-specific guidelines along the entire patient care pathway; adequate diagnostics; and robust cooperation between emergency medical care providers, such as host-country workers, the United Nations, the WHO, allied military personnel and people from conflict areas on hospital admissions in other countries, with adequate explanation to patients.[61]

53 See Safeguarding Health in Conflict (2024).
54 See Fayad et al. (2023).
55 See Petrosillo, Petersen and Antoniak (2023).
56 See Olivera and Reygaert (2024).
57 See Schultze et al. (2023).
58 See Stepanskyi et al. (2024).
59 See Loban et al. (2023).
60 See Moussally et al. (2023).
61 See Pallett et al. (2023).

Figure 3. Rates of death attributable to and associated with bacterial AMR by Global Burden of Disease region (2019)



Source: Antimicrobial Resistance Collaborators (2022).

6. The EBRD's approach

Following the political declaration of the first United Nations General Assembly (UNGA) High-Level Meeting (HLM) on AMR in 2016, the EBRD has engaged holistically on AMR and formally integrated AMR into its environmental and sustainability risk management. It has incorporated AMR risk management into its environmental and social due diligence and integrated AMR actions into environmental and social action plans. It has adapted its transition impact on AMR and undertaken technical cooperation programmes with hospital, pharmaceutical and agribusiness clients. It has explored wastewater-based epidemiological surveillance, undertaken internal capacity building through information dissemination and workshops for EBRD staff, and embarked on collaborations and engagement with stakeholders.

The Bank is committed to promoting strong safeguards and high standards in its projects, as well as supporting the attainment of the SDGs in the regions where it operates. The EBRD recognises the public health, economic and sustainability implications of AMR in its regions. It learns lessons and draws on experience from its climate change and biodiversity strategies.[62] The Bank consistently addresses AMR from the policy level to the project level with a view to creating an impact: identifying and managing AMR risks and opportunities for improvement through sector-specific entry points in the healthcare, pharmaceutical, agribusiness and water sectors. It identifies AMR risks and opportunities during environmental and social due diligence and proposes corresponding actions to be agreed by clients. Such actions are incorporated into environmental and social action plans as part of legal agreements and monitored for progress.

Transition impact on AMR

Transition impact is one of the key principles governing the Bank's operations. The measurement of transition impact is the Bank's assessment mechanism, with its projects incorporating "competitive", "well governed", "green", "inclusive", "resilient" and "integrated" elements to promote open-market economies and entrepreneurship in the regions where it operates. The EBRD recently adopted transition impact AMR scoring for projects in the healthcare and livestock sectors. Transition impact scoring of AMR can be conducted in the "well governed" category if the project aims to go beyond national standards or practices and move towards good international practice (GIP) on AMR. This encourages the project to factor GIP mitigation measures into project-specific environmental and social action plans.

The EBRD's Environmental and Social Policy

The Bank's Environmental and Social Policy recognises the sustainability challenges imposed by AMR and provides a solid base from which clients can improve the sustainability of their business operations in the economies where the Bank operates. The G20 ministerial declaration of 2019[63] praised the EBRD's leadership as the first MDB to incorporate specific references to AMR into its Environmental and Social Policy. The new Environmental and Social Policy for 2024-29[64] addresses the environmental dimension of AMR in Environmental and Social Requirement (ESR) 3, the prevention and mitigation of AMR in human health in ESR 4, and the accountable use of antibiotics in livestock production in ESR 6:

62 See Haralampieva and Herrera-Martínez (2025).

63 See G20 (2019).

64 See EBRD (2024a).

ESR 3: Resource efficiency and pollution prevention and control *Safe use and management of hazardous substances and materials*	To prevent and minimise environmental impacts and contamination with microorganisms and chemicals with antimicrobial properties, the client will apply GIP wastewater treatment and livestock faecal waste treatment.
ESR 4: Health, safety and security *Health and safety risks in community services*	Where the project involves the provision of health services and/or the production, distribution and use of antimicrobials, the client will incorporate antimicrobial stewardship to minimise antimicrobial resistance.
ESR 6: Biodiversity conservation and sustainable management of living natural resources *Sustainable management of living natural resources*	To avoid and minimise antimicrobial resistance, the client will only use antimicrobials on food-producing animals, in accordance with EU substantive environmental standards.

7. EBRD achievements

EBRD institutional capacity building

AMR can be perceived as complex and is unfamiliar to some. Addressing AMR requires a cross-sectoral and cross-disciplinary One Health approach. Questions about AMR raised by colleagues are valuable entry points from which to start conversations on AMR, and this has been one of the approaches adopted by the Bank to raise awareness. By September 2024, 23 AMR articles had been posted on the Bank's intranet, while 20 internal workshops had taken place. For the workshops, various outside speakers were invited from academia, research organisations, industry, philanthropic organisations, civil society, the WHO and the World Bank. World AMR Awareness Week is marked every November by a staff campaign to increase AMR awareness in the EBRD community. The Bank's Communications Department has also used social media to indicate the Bank's support for WAAW to external audiences. The Japanese government supported medical consultants who provided scientific assurances for the EBRD's AMR work for three years.

Technical cooperation for clients and beyond

The Bank has carried out AMR risk management capacity-building technical cooperation programmes for healthcare service, PPP hospital, national Covid-19 response, pharmaceutical and agribusiness projects in Egypt, Georgia, Kazakhstan, Türkiye and Ukraine and across the EBRD regions. The programmes support institutional capacity building, identified as a priority in the NAPs on AMR in the economies where the Bank operates. Lifelong professional training schemes in the medical field are lacking in many countries where AMS is in its infancy. Participating medical professionals welcomed the technical cooperation training.

For healthcare services and hospital clients, the AMR technical cooperation programmes focused on (i) IPC, (ii) microbiology laboratory capacity building, (iii) AMS and (iv) surveillance. Experts from the British Society for Antimicrobial Chemotherapy (BSAC) assessed client capacity and existing risk management systems at facility level, provided advisory services for actions and held training events. AMR-related guidance from the WHO, the US Centers for Disease Control and Prevention (CDC), the BSAC, the ECDC, ministries of health and NAPs has been applied to the Bank's technical cooperation work. Technical cooperation programmes aim to bring sectoral GIP to clients through step-by-step actions in the specific country context.

In Türkiye, the Bank played an instrumental role in organising Turkish experts to conduct a live YouTube AMR workshop (June 2022). More than 280 Turkish medical professionals joined the live session, while more than 2,500 have since watched the recording.[65] Where appropriate, wider healthcare professional communities and regulators have been invited to such training sessions.

The BSAC has developed an online AMR tutorial scheme and an AMS accreditation scheme.[66] The latter was highlighted by the Egyptian delegate at the UNGA-HLM on 26 September 2024 as part of the country's response to AMR and has been part of EBRD projects in Georgia. The BSAC-Pfizer-EBRD Tripartite Alliance for AMR was announced in 2021 to raise awareness of AMR and used the BSAC's open-access e-learning resources for the Bank's healthcare clients following a memorandum of understanding with the BSAC in 2020.

In the pharmaceutical sector, an AMR capacity-building technical cooperation programme in Kazakhstan in 2024 was the first such programme in central Asia focused on sectoral AMS, based on the Common Antibiotic Manufacturing Framework of the AMR Industry Alliance (see Section 9)[67] and good manufacturing practice (GMP). Pharmaceutical companies in the economies where the EBRD operates are helping to secure timely patient access to critical medicines, such as antibiotics, while their role in promoting responsible antibiotic use is valued in the context of NAPs. The BSAC's pharmaceutical industry experts have provided insights into the business and AMR nexus. Kazakhstan remains in the early stages of AMS implementation. However, Bank client and leading Kazakh pharmaceutical company VIVA Pharm's focus on product quality, the consistent implementation of standard operating procedures and

65 See Turkish Ministry of Health (2022).

66 See BSAC (2021).

67 See AMR Industry Alliance (n.d.).

an initiative on the rational use of antiseptics to prevent environmental bacterial resistance in plants are a basis for forward-looking actions to address AMR. This technical cooperation in Kazakhstan demonstrated the firm's leadership commitment to AMS and the Bank's additionality in supporting it. It also underscored the importance that AMS in the sector reflect interactions between drug manufacturers, governments, medical professionals, pharmacy retailers, suppliers and patients.

In 2020, under a long-term collaboration agreement between the Food and Agriculture Organization of the United Nations (FAO) and the EBRD,[68] the Bank embarked on capacity-building technical cooperation on animal health and food safety in Ukraine's agribusiness sector. This initiative aimed to improve the sustainability of animal production by reducing risks associated with transboundary animal diseases and AMR. The technical cooperation programme supported responsible antibiotic use in chicken meat production through systematic actions across the entire supply chain: the adoption of voluntary standards on antibiotic use in poultry production and certified and labelled chicken meat on the shelves of Ukrainian supermarkets, with the cooperation of industrial associations and regulators. This was the first such labelling scheme in the region to create new market incentives for the responsible use of antibiotics through the supply chain by raising awareness among producers and consumers.

In 2021, this technical cooperation effort with the FAO was extended to pig production in Ukraine. On the AMR side, it included a veterinary educational curriculum review against WOAH (formerly OIE) recommendations, and EU guideline-aligned labelling and monitoring for voluntary certification schemes for agricultural products and foodstuffs.[69] The FAO's technical expertise and the EBRD's investment capacity are mutually enhancing.[70]

A team of experts from the Institute of Infection, Veterinary and Ecological Sciences at the University of Liverpool was involved in a technical cooperation programme on cross-regional AMR risk management in the livestock sector from 2021 to 2024. This programme was developed to assist the economies in which the EBRD operates in preparing for the EU's revised regulations on antibiotic use in food-producing animals, enforced in January 2022,[71, 72] as well as the bloc's Green Deal (farm-to-fork) objective of reducing the sale of antimicrobials for farmed animals and aquaculture by 50 per cent by 2030.[73] The team focused on practical guidance for animal food production in EBRD investee economies by integrating biosafety and biosecurity, animal welfare and AMR components. The guidance aims for the most effective use of antibiotics in livestock by avoiding unnecessary, inadequate or abusive use of antibiotics, based on veterinary diagnostics, as well as to preserve WHO medically important antimicrobials for human medicine.[74] Two online training sessions have been provided for Bank staff.

In the wastewater sector, in 2023, the Dutch KWR Water Research Institute conducted a pilot study on wastewater epidemiological surveillance for tracking Covid-19 and other concerns such as AMR. The study found that this surveillance method was a cost-effective early-warning and monitoring tool for Covid-19 occurrence and spread, complementing diagnostic tests. Effective sharing of data with the public and stakeholders can help shape public health policy interventions. The Royal Society of Chemistry's May 2024 position statement on AMR called on governments to "further capitalise on wastewater surveillance technology established during the Covid-19 pandemic to expand our capability to detect biological concerns".[75]

68 See FAO Investment Centre (2024).
69 See European Commission (2010).
70 See EBRD (2021).
71 See European Union (2018).
72 See European Union (2019).
73 See European Commission (n.d.a).
74 See WHO (2017).
75 See Royal Society of Chemistry (2024).

8. Stakeholder engagement

The EBRD has been collaborating with key AMR stakeholders such as clients, industry, investors, governments, civil society, and professional and academic bodies (see Figure 4). Under the One Health approach, such collaboration is required to raise awareness, tap into expertise and resources, and bring about the most effective outcomes.

The Bank has hosted five international AMR symposiums, with keynote speakers including Professor Dame Sally Davies (the United Kingdom's Special Envoy on AMR). At the most recent symposium on Public-Private Cooperation on Global Resilience Against AMR (16 April 2024), Professor Davies warned of the seismic impact of AMR on human, animal and environmental health, food security and economic sustainability, suggesting a roadmap for global governance to address AMR. A wide range of AMR experts from industry, the investment community, academia, civil society, Bank clients and MDBs spoke at the event. The Bank also informed the symposium about the updated AMR sections of the 2024 ESP, which would replace the 2019 ESP, in order to seek the experts' feedback. The symposium, highlighting the urgency of tackling AMR, voiced solidarity in taking action and continuing the fight against AMR.

The Bank has highlighted its AMR engagement at conferences hosted by the WHO, the OECD, *The Economist*, the Wellcome Trust, the Health and Global Policy Institute, the Asia-Europe Foundation and Tsinghua University. For accountability and transparency, the Bank has reported on its AMR engagement in the EBRD's *Sustainability Report* since 2020.[76] Together with the World Bank, the EBRD has organised four MDB AMR network meetings with the Asian Development Bank, the Asian Infrastructure Investment Bank, the International Finance Corporation (IFC) and Germany's KfW Development Bank to share mutual experience of raising awareness in the MDB community and to find common approaches to addressing AMR.

Figure 4. AMR stakeholders

- Governments
- International organisations
- Public-private funding mechanisms for new antibiotics
- Diagnostics/vaccines

- Research/educational/ professional institutions
- Media
- Rating agencies
- Accounting firms

- Livestock producers
- Aquaculture
- Crop producers
- Horticulture
- Food distributors
- Restaurant chains
- Pharmaceuticals
- Healthcare services
- Health insurance
- Life science/medical technology firms
- Water infrastructure

- Pension funds
- Asset managers
- Banks

- Philanthropic funds
- Consumer groups
- Animal welfare and human health/patient groups
- Environmental groups

76 See EBRD (2024b).

9. Private-sector initiatives

Important private-sector initiatives have emerged to tackle global AMR. In 2020, Investor Action on AMR (IAAMR) was launched as a collaboration between the Access to Medicine Foundation, the Farm Animal Investment Risk and Return (FAIRR) Initiative and the UK Department of Health and Social Care to galvanise investor efforts to tackle drug-resistant infections. Supported by 22 investors and representing more than US$ 14 trillion in combined assets, IAAMR aims to cut the excess use of antibiotics in the food supply chain and in healthcare. To safeguard society, economies and the long-term value of investment portfolios, IAAMR encourages investors to formally assess and integrate AMR risks, opportunities and impacts using the holistic and multisectoral One Health approach. It explicitly discusses the adverse impact AMR will have on global financial markets, economic stability and long-term value generation, as well as the need for global cooperation, sustained funding and innovative solutions.[77]

Ahead of the UNGA-HLM on AMR in September 2024, IAAMR issued a public investor statement, endorsed by 80 investors, calling on global leaders to take decisive and coordinated action to curb AMR to safeguard global health, economic stability and financial markets.[78] IAAMR, together with the MSCI Sustainability Institute and FAIRR, published *Health and Wealth: The Investors' Guide to Antimicrobial Resistance (AMR), A Growing Global Health Crisis* in August 2024.[79] This guide provides an introduction to the investment risks and opportunities associated with AMR. It focuses on the livestock, food, pharmaceutical, biotechnology, life science and managed healthcare sectors. It sets out a view on AMR risk and the necessary robust response by the environmental, social and governance (ESG) community.

The pharmaceutical industry has launched its own AMR initiatives. The AMR Industry Alliance (AMRIA) is one of the largest private-sector coalitions aimed at providing sustainable solutions to AMR, with more than 100 biotech, diagnostic, generic and research-based pharmaceutical companies and associations joining forces. It spans the commercial manufacturing of antibiotic pharmaceutical active ingredients and drug products, representing around 30 per cent of human antibiotic production.

In 2018, the AMRIA launched the Common Antibiotic Manufacturing Framework, which proposes a risk-based approach to assessing and controlling antibiotic manufacturing waste streams. In 2022, to formalise the framework, the AMRIA published its Antibiotic Manufacturing Standard, comprising numerical emissions standards at the point of production. These aim to reduce the risk of antibiotic resistance and aquatic ecotoxicity developing in the environment as a result of the manufacture of specifically human antibiotics. In 2023, the British Standards Institution (BSI) developed a certification scheme to verify that antibiotics are manufactured in conformance with AMRIA standards. This provides guidance to manufacturers in the global antibiotic supply chain to ensure that their antibiotics are made responsibly to minimise the risk of AMR in the environment.[80] This is a voluntary scheme for the sector, though the certification is required to meet various national healthcare-system antibiotic-tendering environmental compliance requirements and will ultimately prepare firms for the national regulations that may come into force several years down the road.

The US Food and Drug Administration (FDA), the European Medicines Agency (EMA) and national legislation currently have no formal regulations governing antibiotic concentration limits in pharmaceutical wastewater, for example.[81] India attempted to draft such regulations, but withdrew them, while Sweden is currently contemplating their introduction. In September 2024, the WHO published its first ever guidance on antibiotic pollution from manufacturing. The new guidance on wastewater and solid waste management for antibiotic manufacturing provides human health-based targets to reduce the risk of the emergence and spread of AMR and to address the risks to aquatic life caused by all antibiotics intended for human, animal or plant use. It covers all steps from the manufacturing of active pharmaceutical ingredients and

77 See Investor Action on AMR (n.d.).

78 See Investor Action on AMR (2024).

79 See FAIRR (2024).

80 See AMR Industry Alliance (2022).

81 See Wellcome and Boston Consulting Group (2022).

formulations to finished products, including primary packaging.[82] WHO member countries may develop national standards based on the guidance in the coming years.

The UK NAP on AMR (2024-29) refers to the environmental impact of antibiotic manufacturing and the need for standards such as the AMRIA Antibiotic Manufacturing Standard and the BSI Minimised Risk of AMR certification.[83] The UK National Health Service (NHS) announced in August 2024 that pharmaceutical companies applying for a contract through its antibiotic subscription model would have to prove they were meeting responsible antibiotic manufacturing standards through BSI Minimised Risk of AMR certification against the AMRIA Antibiotic Manufacturing Standard.[84]

82 See WHO (2024).

83 See Government of the United Kingdom (2024).

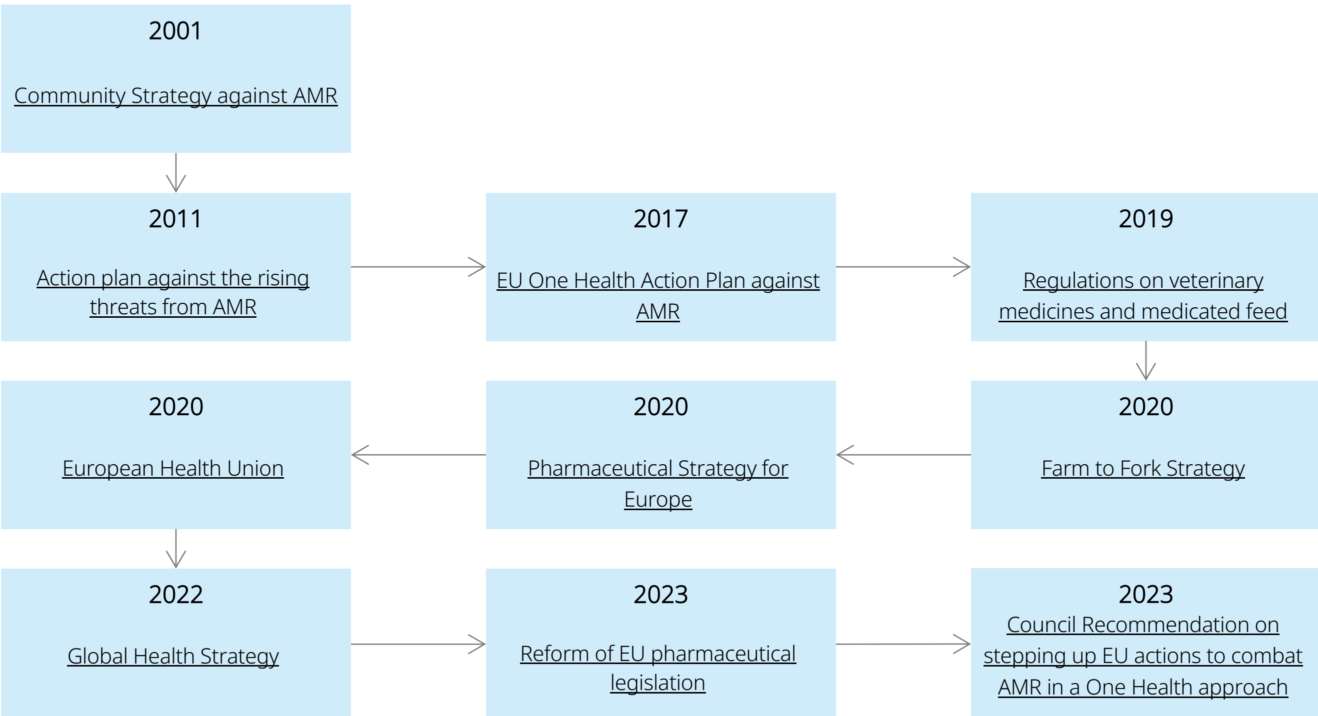
84 See Dall (2024).

10. EU framework on AMR

Back in 2001, the EU identified the importance of tackling AMR with the adoption of the 2001 Community Strategy against AMR. The bloc's AMR policy was subsequently reinforced with the European Commission's 2011 Action plan against the rising threats from AMR. In 2017, the Commission adopted the EU One Health Action Plan against AMR, which aims to make the EU a best-practice region, boost research, development and innovation, and shape the global agenda. Though varying from region to region, overall consumption of antibiotics in humans in the EU/EEA decreased by 23 per cent between 2011 and 2020. Total antimicrobial consumption by food-producing animals decreased by 44 per cent between 2014 and 2021.[85]

In 2023, the Council of the European Union adopted a recommendation on stepping up EU actions to curb AMR in a One Heath approach.[86] This complements the 2017 EU One Health Action Plan against AMR. The recommendation aims to: (i) strengthen One Health NAPs against AMR; (ii) reinforce surveillance and monitoring of AMR and antimicrobial consumption; (iii) strengthen IPC; (iv) strengthen AMS and the prudent use of antimicrobials; (v) set recommended targets for AMR and antimicrobial consumption in human health (for example, a targeted 20 per cent reduction in total antibiotic consumption by 2030); (vi) improve awareness, education and training; (vii) foster research and development (R&D) and incentives for innovation, as well as access to antimicrobials and other AMR medical countermeasures; (viii) increase cooperation; and (ix) enhance global action.[87] The European Commission and its agencies – the EMA, the European Food Safety Authority (EFSA) and the ECDC – cooperate closely on the One Health concept. The EU4Health and Horizon Europe programmes provide funding for actions against AMR.[88]

Figure 5. Chronology of EU AMR policy



Source: European Commission presentation at an EBRD AMR conference, 16 April 2024.

In terms of legislation on the use of antibiotics in food-producing animals, EU Regulation 2019/61 on Veterinary Medicines and EU Regulation 2019/4 on Medicated Feed have been in force since January 2022, aimed at

85 See ECDC (2022).
86 See European Commission (2023).
87 See European Union (2021).
88 See European Commission (n.d.b).

stringently restricting the prophylactic and metaphylactic use of antibiotics to exceptional circumstances. These are the most important regulations in the area since the 2006 ban on the use of antibiotics as growth promoters.

Where the environmental monitoring of AMR is concerned, the European Commission has adopted a Water Framework Directive, an Environmental Quality Standards Directive and a Groundwater Directive (including monitoring of antimicrobial properties, for example). In addition, the EEA-European Topic Centre (Biodiversity and Ecosystems) and the European Environment Information and Observation Network (Eionet, a network of 38 European countries) ran a project from 2023 to 2025 to monitor AMR in surface water. This joint effort has contributed to the development of an integrated AMR surveillance system based on a One Health approach. The EU has also adopted a proposal for a directive on soil monitoring and resilience that includes AMR.[89]

In 2023, the European Commission adopted a proposal for a new directive and regulation to revise and replace the bloc's current general pharmaceutical legislation. To encourage the development of innovative antimicrobials, the Commission has proposed a "transferable data exclusivity voucher", which will give developers of new antimicrobials an extra year of regulatory data protection. This aims to address difficulties in bringing much-needed new antibiotics to patients across the EU. The system will make it more attractive for businesses to develop innovative antimicrobials without direct financial contributions from EU member states. The vouchers will be granted and used under strict conditions.[90]

In March 2025, the Commission proposed the Critical Medicines Act to improve the availability, supply and production of critical medicines within the EU[91] in response to shortages of critical medicines such as existing antibiotics in the region. The Commission is seeking to map supply chain vulnerability, strengthen monitoring of demand and supply, communicate with market authorisation holders (MAHs), facilitate stockpiling and joint purchasing arrangements, and explore onshoring of the production of active pharmaceutical ingredients (APIs) to safeguard regional health security.[92] In the case of antibiotics, 80 per cent of all APIs used in Europe come from China, and the recent shortages of critical antibiotics have compelled the EU to consider the possibility of onshoring with policy support as a matter of urgency.[93, 94] As seen in Section 2, there are increasing global concerns about the sustainability of the supply of existing antibiotics,[95] with the implications for Africa being discussed in Section 12.

89 See European Commission (2024).

90 See Blaney et al. (2023).

91 See https://health.ec.europa.eu/medicinal-products/legal-framework-governing-medicinal-products-human-use-eu/critical-medicines-act_en.

92 See Panteli et al. (2024).

93 See European Court of Auditors (2025).

94 See Financial Times (2025).

95 See Skender and Zhang (2024).

11. Global governance

The political declaration on AMR[96] by the second UNGA-HLM on 26 September 2024[97] and the Jeddah Commitments to Accelerate Actions on AMR (16 November 2024)[98] by the fourth global High-Level Ministerial Conference (HLMC) on AMR galvanised global political commitment to address AMR. Following up on that political declaration, a draft founding document establishing the Independent Panel on Evidence for Action against AMR was published for consultation in November 2025. The fifth HLMC on AMR in Abuja, Nigeria, in June 2026 will serve as a global platform for high-level dialogue and turn political commitments into actionable strategies. The WHO has long recognised the need for a concerted global effort to contain AMR; to this end, it convened scientific working groups back in 1994 to address the issue.[99] The WHO published the first global strategy on AMR in 2001.[100] Global uptake was slow and, 14 years later, it issued the Global Action Plan (GAP) on AMR together with the FAO and the WOAH.[101]

The GAP promotes five strategic objectives to:
(i) improve awareness and understanding of AMR through effective communication, education and training; (ii) strengthen the knowledge and evidence base through surveillance and research; (iii) reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures; (iv) optimise the use of antimicrobial medicines in human and animal health; and (v) develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions. To enforce the GAP, the 194 member states of the WHO committed to integrating the above five GAP objectives into their NAPs on AMR.[102] Multi-stakeholder consultations took place in 2025 to update the GAP on AMR for adoption in 2026 and address UN member states' desire – as outlined in the 2024 political declaration – to ensure a robust and inclusive multisectoral response, through a One Health approach, that aligns with current realities to drive greater impact in tackling antimicrobial resistance.[103]

The political declaration of the 2016 UNGA-HLM on AMR represented a landmark in the world's commitment to tackling AMR, calling for greater urgency and action in response to the challenge.

In 2019, based on the recommendations of the ad hoc Interagency Coordination Group (IACG) on AMR, the Tripartite of the FAO, the WHO and the WOAH formed the Joint Secretariat on AMR. In 2022, the United Nations Environment Programme joined the group, and the Secretariat was renamed the Quadripartite Joint Secretariat (QJS) on AMR.

The QJS on AMR facilitates interagency coordination among the Quadripartite. The Quadripartite Strategic Framework on AMR, coordinated by the QJS, supports efforts to scale up national responses to AMR, as well as efforts to mobilise resources in the multilateral system, including UN member states, the G7 and the G20. The QJS supports the operations of global governance structures, including the GLG on AMR and the AMR Multi-Stakeholder Partnership Platform, as well as the United Nations Multi-Partner Trust Fund.

The GLG on AMR was established in 2020 by the Quadripartite organisations to accelerate political action on AMR. The GLG is composed of heads of state, serving or former ministers and/or senior government officials acting in their individual capacities. The mission of the GLG is to collaborate globally with governments, agencies, civil society and the private sector through a One Health approach, advising on and advocating for prioritised political actions for the mitigation of drug-resistant infections through responsible and sustainable access to and use of antimicrobials.[104]

The presidencies and members of the G7 and G20 also advocate for an end to AMR. The G7 has explicitly mentioned AMR in outcome documents from the

96 See UNGA-HLM (2024a).
97 See UNGA-HLM (2024b).
98 See United Nations (2024).
99 See Prestinaci, Pezzotti and Pantosti (2015).
100 See WHO (2001).
101 See ReAct (n.d.).
102 See WHO (2016).
103 See https://www.qjsamr.org/multistakeholder-partnership-platform/multi-stakeholder-consultations-on-gap-amr.
104 See Dogan (2024).

presidencies of the United Kingdom (2021), Germany (2022), Japan (2023) and Italy (2024), while AMR has featured in G20 Leaders' Declarations in Saudi Arabia (2020), Italy (2021), Indonesia (2022), India (2023) and Brazil (2024).[105, 106, 107] The third global HLMC on AMR was held in Muscat, Oman, on 24-25 November 2022 (the first having been in 2014). The Muscat Manifesto,[108] endorsed by about 50 countries since 2022, includes, for the first time, targets on antimicrobials in agrifood systems, animal health and human health. The UNGA-HLM on AMR of 26 September 2024 was the second opportunity to discuss AMR since 2016, followed by the fourth HLMC on AMR in Jeddah, Saudi Arabia. Global high-level political commitment is a prerequisite for effective local, national and global-level action to tackle AMR, particularly with regard to funding, policy development and multi-sectoral collaboration. In a political declaration, UN members have committed to new targets and practical steps to address this global threat to humans, animals, plants and the environment.

Future ministerial conferences and parallel processes, such as G7 and G20 discussions, will be well placed to capitalise on the focus the UNGA-HLM provides. Targets set by the UNGA-HLM on AMR, as well as the coordinating structure of the QJS and the anticipated Independent Panel for Evidence on Action Against AMR (to be established in 2026) espoused by the Jeddah Commitments, are a solid structural basis for furthering global efforts to tackle AMR. The fifth HLMC on AMR will be held in Nigeria in 2026 and the next UNGA-HLM on AMR will be held in 2030. Together, these fora should provide an opportunity to lay the foundations for stronger global AMR governance and consolidate political support accordingly. Funding implementation, particularly in low-income countries, requires continuous effort.

105 See Wellcome (2024).

106 See Global AMR R&D Hub (2024).

107 See G20 Brazil (2024).

108 See Third Global High-Level Ministerial Conference on Antimicrobial Resistance (2022).

12. The EBRD's new sub-Saharan Africa region, pharmaceutical developments and AMR

Benin, Côte d'Ivoire, Kenya, Nigeria and Senegal all became EBRD economies of operation in 2025. The Bank was already investing in Egypt, Morocco and Tunisia, and this expansion sees the EBRD operating in sub-Saharan Africa (SSA) for the first time. This section explores pharmaceutical developments in Africa and their possible contribution to combating AMR.

The AMR burden in Africa

The WHO's 2025 AMR surveillance report states that the number of countries reporting on AMR increased by 300 per cent between 2016 and 2023. However, large parts of SSA, central Asia and Latin America continued to contribute little or no AMR data.[109] Countries with the weakest surveillance and lowest universal health coverage (UHC) often reported the highest levels of resistance (although this might, in part, be driven by a bias towards sampling only the most unwell patients). Resistance was most frequently observed in south-east Asia and the eastern Mediterranean, which accounted for almost one in three laboratory-confirmed bacterial infections – followed by Africa, which accounted for one in five. In 2019, SSA had the highest AMR burden worldwide, with a death rate of 24 per 100,000 people, followed by south Asia with 22 per 100,000.[110] According to the Africa Centres for Disease Control and Prevention (Africa CDC), AMR is now a leading cause of death in Africa, surpassing fatalities from malaria, HIV and tuberculosis.[111] SSA faces significant challenges in combating AMR, due to limited resources and a disproportionately large economic and health burden relative to other regions. Key drivers include:

- limited access to healthcare (with the region having a UHC rate of just 43 per cent – the lowest in the world)[112]
- suboptimal vaccination rates
- antibiotic accessibility issues and misuse (including an inability to access the right antibiotics at the right time, self-medication, the circulation of substandard and counterfeit antibiotics, and the misuse of antibiotics in healthcare settings)
- poor surveillance (as seen above)
- lack of clean water, sanitation and hygiene (WASH) infrastructure
- poverty.[113]

A 2019 report by the United Nations Children's Fund (UNICEF) and the WHO found that only half of all health facilities in SSA have basic water services, with just 23 per cent having basic sanitation.[114] Infections associated with poor handwashing facilities, clean water and decent toilets at healthcare facilities are costing SSA US$ 8.4 billion annually in GDP and health budgets.[115]

Africa's pharmaceutical manufacturing landscape

Health systems in Africa differ significantly by country, but there is a common interest in expanding local production of critical medicines (such as antibiotics), vaccines and medical devices. Nearly half of the continent's population lacks reliable access to essential medicines,[116] undermining the foundations of health systems. Supply-chain disruptions experienced during the Covid pandemic further highlighted the need for a sustainable medical supply.

WHO member states in Africa import between 70 and 100 per cent of finished pharmaceutical products (FPPs), 99 per cent of vaccines, and between 90 and 100 per cent of medical devices and APIs. Half of all African countries have no pharmaceutical production, and just eight countries (Egypt, Tunisia, Algeria, Morocco, South Africa, Senegal, Nigeria and Ethiopia) – half of which are in North Africa – account for 85 per cent of the continent's 690 pharmaceutical manufacturing facilities.[117] The local drug industry on the continent is characterised by manufacturers of generic medicines.

109 See WHO (2025a).
110 See Antimicrobial Resistance Collaborators (2022).
111 See Africa CDC (2024).
112 See WHO (2023c).
113 See Totaro et al. (2025).
114 See WHO and UNICEF (2019).
115 See WaterAid (2024).
116 See WHO African Region (2025).
117 See UNCTAD (2025b).

Most generic medicines consumed in African countries are branded generics produced locally or in Asia, as branded originator drugs remain limited due to higher prices.[118]

A United Nations Conference on Trade and Development (UNCTAD) report in 2025[119] highlights the fact that Africa only captures about 5 per cent of global greenfield foreign direct investment (FDI) in pharmaceutical manufacturing. Scale remains a major challenge, with most pharmaceutical facilities in the region operating at just 30 to 60 per cent capacity, compared with over 70 per cent in more advanced economies. Manufacturing of pharmaceuticals is driven largely by domestic small and medium-sized enterprises (SMEs) based on a mixed – rather than fully local – business model involving the importation of APIs for local formulation. An emphasis on generic drugs sees profit margins driven by costs and volumes, exposing the African pharmaceutical industry to major competition from global manufacturers in Asia. Counterfeit and substandard medicines, including antimicrobials, are a further issue in the region.[120]

Potential for local production

Pre-pandemic analysis by McKinsey & Company[121] indicated that under the right conditions, some SSA countries had the potential to develop a robust local pharmaceutical industry. It acknowledged that local manufacturers tended to be more responsive to local health needs than global MAHs, which face limited commercial incentives to register all medicines due to small, fragmented markets. It recommended (i) improving manufacturing quality (given that only some pharmaceutical plants in SSA comply with WHO good manufacturing practice), (ii) modernising distribution, wholesaling and retailing, (iii) harmonising and streamlining regulations (drawing on regulatory harmonisation efforts by the African Medicines Agency (AMA) for African medicines), (iv) scaling up production with support from special economic zone (SEZ) infrastructure, (v) harnessing the African Continental Free Trade Area (AfCFTA) and (vi) focusing on the right part of the value chain (with APIs very scale-sensitive, for example).

UNCTAD's 2025 report[122] further emphasises that increased local manufacturing of products such as antibiotics and vaccines can yield benefits through (i) timely availability of high-quality drugs, (ii) improved national health sovereignty, (iii) job creation and economic impact, (iv) human capital development and technology transfer via FDI, and (v) the nurturing of local industry and long-term economic development.

The majority of the antibiotics that are required to treat infections are relatively low-cost with thin profit margins.[123] Pharmaceutical companies may prioritise higher-margin products, but from a health security and public health perspective, securing access to antibiotics remains critical. For instance, in Ethiopia, locally produced antibiotics have a market share of around 50 per cent, significantly higher than other pharmaceutical products. However, improving the investment landscape is key to attracting further FDI and boosting local production.[124]

Africa's commitment to local production

African leaders have committed to boosting local production, strengthening regulatory systems and implementing pooled procurement mechanisms under the 2024 Framework for Medicines, Vaccines and Other Health Technologies in the WHO African Region (2025-35). This strategy aims to reduce dependence on imports, particularly from Asia, and improve access to high-quality, safe, effective and affordable medicines, vaccines and other health technologies.[125]

The African Medicines Agency was established by the African Union (AU) in 2018 to regulate access to medicines, support local manufacturing and address regulatory gaps. An AMA assessment in 2017 found that nearly all African countries had a national medicines regulatory agency (NMRA) or an equivalent administrative entity. Of these, over 90 per cent lacked sufficient capacity to carry out core regulatory functions.[126]

Private investment in the pharmaceutical sector

Pharmaceutical sales in Africa are expected to nearly double from about US$ 26.5 billion in 2021 to

118 See Institute for Economic Justice (2022).
119 See UNCTAD (2025a).
120 See Tegegne et al. (2024).
121 See McKinsey & Company (2019).
122 See UNCTAD (2025a).
123 See Sharland et al. (2024).
124 See UNCTAD (2023).
125 See WHO African Region (2024).
126 See Ndomondo-Sigonda et al. (2017).

US$ 46 billion in 2031, representing a compound annual growth rate (CAGR) of 6 per cent over that period.[127] North African markets currently account for approximately 40 per cent of total sales. However, the market remains highly concentrated: the top seven countries account for about 75 per cent of demand, while more than 40 countries – constrained by regulatory harmonisation and distribution challenges – account for total market demand of less than US$ 1 billion.[128] Private investment appears to be increasingly active, particularly in larger markets (see Annex 3).

127 See African Export-Import Bank (2022).

128 See AfDB (2022a).

13. Investment in SSA by the EBRD and other MDBs

MDBs including the EBRD, the African Development Bank (AfDB), the European Investment Bank (EIB) and the World Bank Group have an important role to play in helping to tackle the AMR crisis in the region and supporting access to appropriate antibiotics. Their private-sector experience means that they are well positioned to offer policy and technical advice.

EBRD investment

EBRD investment in Africa's pharmaceutical sector to date includes: a loan to MS Pharma in 2014 to support investment in its Moroccan and Jordanian subsidiaries;[129] an equity investment in Zanzibar Pharma, a newly created UK holding company, in partnership with other co-investors (a development finance institution funded by the UK government and private equity fund ADP III) to acquire and consolidate generic drug manufacturers, with a focus on North Africa (which included the purchase of Egyptian generic-drug maker Adwia Pharmaceuticals in 2021);[130] a loan to Morocco's Dislog Group in 2020 to acquire Steripharma, a local manufacturer of affordable generic medicines, and construct a new green-certified industrial building equipped with solar panels to decarbonise operations;[131] and an investment in and subsequent exit from Ibnsina Pharma, an Egyptian company specialising in the distribution of pharmaceutical products, as part of the EBRD's strategy of supporting private-sector development in Egypt.[132]

The role of MDBs

MDBs have a specific role to play in supporting Africa's efforts to boost local manufacturing of pharmaceuticals. The AfDB, for example, has established the African Pharmaceutical Technology Foundation (APTF) to boost local drug and vaccine production and support investment in pharmaceutical manufacturing and infrastructure. It estimates that US$ 111 billion will be needed by 2030 to fund the growth of Africa's local pharmaceutical industries: US$ 11 billion to develop the industry and US$ 100 billion to develop the supporting infrastructure.[133]

The AfDB intends to finance at least 10-15 manufacturing and private pharmaceutical logistics projects in the next five years through long-term debt and, potentially, technical assistance. The focus will be on projects that produce and/or distribute pharmaceutical products at the regional level, capturing economies of scale, including through sub-regional production sites across Africa. The AfDB will also support expansion projects regionally and leverage sovereign operations to create pharmaceutical-focused enclaves and industrial parks. It envisages that 20 per cent of its pharmaceutical investments will target value chains, including logistics, distribution and retail chains.[134]

As indicated above, MDBs' investments in the pharmaceutical sector involve the construction of production facilities, the enhancement of logistics and storage capabilities, the development of distribution hubs, the expansion of pharmacy networks, the implementation of digital solutions, the advancement of research and development (R&D) and the facilitation of acquisitions. The IFC has invested US$ 9 billion globally in the private healthcare sector since 1999, including pharmaceutical projects.[135] MDBs' common objectives for such investments, as extracted from project descriptions, are (i) local manufacturing of generics and API production, (ii) increases in production and technological capabilities, (iii) availability and affordability of essential drugs, (iv) R&D and (v) digitalisation.[136]

MDBs' approach to investing in the pharmaceutical sector – both in general and in Africa in particular – has not yet focused specifically on antibiotics or the challenges of AMR. Antibiotics are important everywhere, but they are especially important in Africa, as the region still has high infection rates, a weak supply

129 See https://www.ebrd.com/home/work-with-us/projects/psd/45636.html.

130 See https://www.ebrd.com/home/work-with-us/projects/psd/51370.html.

131 See https://www.ebrd.com/home/work-with-us/projects/psd/55591.html.

132 See https://www.ebrd.com/home/news-and-events/news/2025/EBRD-exits-Ibnsina-Pharma-in-Egypt.html.

133 See AfDB (2022b).

134 See AfDB (2022a).

135 See IFC (n.d.).

136 See IFC (2025b).

chain that struggles to deliver the right antibiotics at the right time and – especially in SSA – high levels of AMR deaths despite the lowest antibiotic consumption rates.[137]

Indeed, the World Bank has issued a series of publications on AMR, recognising it as a “grand pandemic”.[138] The World Bank’s Health Emergency Preparedness and Response (HEPR) Program[139] and its Health Security Program[140] are supporting the development of regional pharmaceutical and vaccine manufacturing and logistical capabilities to reduce Africa’s reliance on imports. In Rwanda, this includes planned investment in the construction and equipping of a One Health Laboratory in Kigali to strengthen local capabilities for disease surveillance and response while contributing to the country’s broader pharmaceutical ecosystem.[141]

MDBs’ concerted engagement on antibiotics and AMR issues in their pharmaceutical strategy and policy dialogue makes good sense. UNCTAD’s 2025 report[142] posited that despite public support, current policies lacked targeted incentives for antibiotic production in Africa. It highlighted the need for refined product- and country-specific interventions for antibiotics that would: address common AMR challenges and gaps in incentive schemes for shared policy recommendations, including improved information systems; incentivise compliance with GMP; promote stronger regional integration and exploration of joint API procurement; and develop tailored investment strategies to meet each country’s unique feasibility and industrial goals. MDBs can help address these challenges by leveraging their financing capacity and established channels for engagement with governments and the private sector. Potential regional production of antibiotics and AMR response strategies need to be integral to MDBs’ approaches to pharmaceutical investment in Africa.

WHO Model List of Essential Medicines and the AWaRe system

Africa’s challenge in securing sustainable access to safe, affordable and effective antibiotics is set against a complex and fragile global antibiotic production and distribution system. As discussed in Section 2, economic factors such as cost and volume sensitivity, low commercial returns across the supply chain, disincentives for manufacturers to invest in quality and geographically concentrated production of APIs and key starting materials (KSMs) in China and India are contributing to fragility of supply and shortages. MDBs’ investment guidance for pharmaceutical development in SSA can help to address these challenges.

Further contributing factors include variations in national antibiotic formulations, dosage and packaging,[143] a proliferation of products in excess of those on the WHO Model List of Essential Medicines (with only 41 listed,[144] but over 250 different antibiotics in production[145]), fragmented supply management, and relatively low – and unpredictable – demand for antibiotics.[146] As seen in Section 2, responses to shortages are emerging in high-income countries, but these have not yet translated into scalable solutions for LMICs.[147]

In LMICs, inherent institutional, financial and infrastructure constraints, combined with small market size, often impede reliable access to required antibiotics.[148] Unlike successful global health initiatives such as the Global Fund to Fight AIDS, Tuberculosis and Malaria[149], which mobilises billions of US dollars and coordinated supply chains, there is no equivalent large-scale pooled procurement system or financing for a broad range of essential antibiotics.[150] This gap compromises health outcomes, increases costs and is a major public health and health security challenge across the African region.

At the 2024 UNGA-HLM on AMR,[151] member states committed to a target of having 70 per cent of human

137 See GBD 2019 Antimicrobial Resistance Collaborators (2022).
138 See World Bank (2017, 2018, 2019, 2021, 2024) and World Bank and WHO (2022).
139 See https://www.healthemergencies.org.
140 See https://projects.worldbank.org/en/projects-operations/project-detail/P179078.
141 See IFC (2025a).
142 See UNCTAD (2025a).
143 See Ardal et al. (2024).
144 See WHO (2025b).
145 See Sharland et al. (2022).
146 See Charles River Associates (2023).
147 See WHO and GARDP (2024).
148 See CDDEP (2019).
149 See https://www.theglobalfund.org/en.
150 See Otaigbe (2025).
151 See UNGA-HLM (2024a).

antibiotic use being "Access" antibiotics under the WHO's AWaRe system by 2030.[152] The WHO Model List of Essential Medicines[153] and the AWaRe system not only inform optimal use, but also provide a framework for aligning supply-side strategies to improve access and production.

The Access/Watch/Reserve (AWaRe) system is a simple traffic light system which categorises antibiotics used for humans in four groups to improve the quality of antibiotic use:

Access – (Green) essential first-line medicines that should be widely available

Watch – (Yellow) medicines used for more serious infections (mainly in hospital)

Reserve – (Red) medicines of last resort for severe multidrug-resistant infections

Not Recommended – for example, irrational fixed dose combinations.

Access antibiotics are effective for treating the most common bacterial infections in primary care, have a lower risk of driving resistance, and are generally safer and less expensive than Watch and Reserve antibiotics. Watch antibiotics tend to be more costly, have a broader spectrum of activity, and carry a higher risk of resistance and toxicity. Use of Watch antibiotics remains relatively high in many settings, with only one in three of the countries covered by WHO surveillance in 2022 meeting the UN's target of having Access antibiotics account for 70 per cent of antibiotic use in humans.[154]

Many countries are considering setting national targets to mirror the UN's 70 per cent commitment. For these targets to be met, significant shifts – away from Watch and Not Recommended medicines, towards high-quality oral Access formulations – are likely to be required in the production and use of antibiotics. The overuse of Watch antibiotics leads to faster emergence of resistance, worse clinical outcomes, higher costs and toxicity, and takes manufacturing capacity away from a more rational product choice.[155]

As discussed previously, although more than 250 distinct antibiotics are in production globally, only 41 are included in the WHO Model List of Essential Medicines,[156] and over 90 per cent of oral antibiotics are taken in primary care settings.[157, 158] Available data on antibiotic flows through procurement and distribution networks remain very limited. Incorporating the Model List of Essential Medicines and the AWaRe system in digitalised procurement and prescription systems has the potential to improve monitoring, reduce stockouts and strengthen antibiotic supply chains.

MDB engagement with UN agencies

Looking ahead to the fifth HLMC on AMR in Abuja, Nigeria, in June 2026, MDBs (including the EBRD) may wish to engage with UN agencies such as the WHO and UNCTAD, as well as governments and other stakeholders, to address antibiotic and AMR challenges within local pharmaceutical manufacturing development strategies. Recommendations for local pharmaceutical manufacturing in Africa, taking into account the specific conditions of relevant countries, could include the following:

- supporting the production of high-quality, affordable, essential Access antibiotics
- investing in the production of Watch antibiotics only where there is a demonstrable need and national regulatory approval (for example, for antibiotics listed on the WHO Model List of Essential Medicines or national lists)
- avoiding investment in the production of antibiotics that the WHO categorises as Not Recommended
- where appropriate, investing in the local/regional manufacture of APIs and KSMs for essential antibiotics.

Where MDBs invest in the strengthening of supply chains, the AWaRe system can be a valuable tool for monitoring and managing the supply of antibiotics, ensuring that distribution to facilities is adequate and appropriate.

In the context of African pharmaceutical development, investment by MDBs in collaboration with other stakeholders can help to address market fragmentation and foster regional integration. Coordinated efforts can support regulatory harmonisation and trade under the AfCFTA, strengthen infrastructure in special economic

152 See WHO (2023a).
153 See WHO (2025b).
154 See WHO (2025c).
155 See Zanichelli et al. (2023) and WHO (2025c).
156 See Sharland et al. (2022).
157 See Llor and Bjerrum (2014).
158 See Lim et al. (2025).

zones, and enhance the quality of local manufacturing through adoption of GMP standards. MDB engagement can also contribute to the development of human capital, digital systems for the authentication of medicines, and joint strategies to combat substandard and counterfeit drugs.

Furthermore, MDBs can collaborate with other stakeholders such as the WHO and the Africa CDC to facilitate pooled procurement mechanisms, improve demand forecasting and stock planning, strengthen API supply chains, and advance long-term strategies for local API production. These measures, together with improvements to the investment climate for FDI, should be reinforced through tailored strategies that reflect each country's feasibility conditions.

MDBs' integrated approach – balancing public health objectives with private investment, guided by the WHO Model List of Essential Medicines and the 70 per cent target for use of Access antibiotics – will be critical for the region's pharmaceutical development. The potential impact of this cannot be overstated in the context of ongoing shifts in the foreign aid landscape, geopolitical tensions, reductions in FDI flows and rising debt burdens across the region. Recent warnings from the Africa CDC stress that significant aid cuts could lead to an additional 2 to 4 million preventable deaths annually in Africa. This unprecedented convergence of crises is threatening to reverse decades of progress in health security and economic development in Africa.[159]

159 See Africa CDC (2025).

14. Next steps

A concerted effort is required to minimise AMR risks, address the misuse and overuse of antibiotics, and ensure access to quality antibiotics in LMICs. There are, however, science-based and proven interventions to prevent and control AMR. These have been reflected in the Bank's current AMR capacity-building exercises: (i) IPC; (ii) AMS, laboratory and surveillance capacity building in healthcare settings; (iii) an e-learning and voluntary accreditation scheme on AMS; (iv) AMS in the pharmaceutical value chain and adherence to GIP; (v) regulation of over-the-counter sales of antibiotics; (vi) rational use of antimicrobials and the improvement of biosafety and biosecurity in food animals; (vii) a new labelling scheme to create a new market for rational antibiotic use in food animals; and (viii) awareness raising. The Bank's investments in the water sector have contributed to better access to clean water, sanitation and hygiene (WASH) services. The Bank also supports local businesses that tackle AMR, as seen in the example of phage production with GMP certification in Georgia (see case study in Annex 1).

The Lancet's AMR series suggests that existing interventions can have a significant impact on AMR in LMICs.[160] It indicates that reducing global AMR-associated deaths by 10 per cent by 2030 (the target set by the 2024 UNGA-HLM political declaration on AMR) is achievable with existing interventions. It estimates, for example, that aligning IPC standards in LMIC healthcare settings with those of high-income countries could prevent up to 337,000 AMR-associated deaths annually. Securing universal access to WASH services could prevent up to 247,800 AMR-associated deaths annually. Achieving universal coverage for high-priority paediatric vaccines – such as vaccines against rotavirus, pneumococci and respiratory syncytial virus (RSV) – could prevent up to 181,500 AMR-associated deaths a year in LMICs, as vaccine-based prevention of infections obviates the need to use antibiotics to treat viral infections. Improved access to existing and new antibiotics, vaccines and diagnostics is also needed. Innovation should focus on LMICs, where the burden of AMR is greatest.[161]

Strengthening local production of critical medicines (such as antibiotics) and medical devices in LMICs has gained renewed emphasis in response to the supply-chain disruptions during the pandemic, as well as to build more resilient health systems. As discussed in Section 13, the EBRD could consider supporting such initiatives alongside other MDBs and relevant stakeholders, through targeted investments. Strengthening local production will require investment and PPPs, where the Bank could play a key role. Efforts to develop local pharmaceutical manufacturing should be guided by the WHO Model List of Essential Medicines and aligned with the 70 per cent target for use of Access antibiotics. Furthermore, major infrastructure gaps persist: only 52 per cent of healthcare facilities in sub-Saharan Africa had a basic water service in 2021.[162] The Bank may therefore also assess its role in supporting WASH investments in prospective investee economies across the region.

The Bank will continue its AMR engagement based on the global agreement formed by the UNGA-HLM on AMR, the fourth HLMC on AMR (November 2024) and the G7 and G20 AMR work streams. The Bank will embark on this journey alongside stakeholders by using its investment, technical cooperation and policy dialogue in accordance with its sustainability mandate, the Environmental and Social Policy, and the One Health approach. The Bank's continuous work on AMR with stakeholders in the economies where it operates will increase awareness of how acute the AMR challenge is and help to scale up their AMR engagement. Furthermore, MDBs such as the EBRD could explore the links between climate change, biodiversity, pollution, waste and AMR, rather than working in silos, as these issues are interactive and intertwined and critical to national attainment of the SDGs[163] (see Annex 2).

160 See The Lancet (2024).

161 Ibid.

162 See Ren et al. (2022).

163 See Haralampieva and Herrera-Martínez (2025).

Annex 1. Case study: Georgian engagement on AMR and phages

In 2023, the Bank's long-term client Vian Caraps Medline (formerly Georgia Healthcare Group) received an EBRD Gold Award for environmental and social best practice for its engagement on AMR. Vian is the largest healthcare services provider in Georgia, operating hospitals, clinics, pharmacies, medical insurance and laboratory services. It accounts for 20 per cent of the healthcare services sector in Georgia by number of beds and has over 15,000 full-time employees. Because of its leading position in the country's health sector, its AMR engagement is critical.

Vian is the Bank's first client to address AMR, participating in a pilot programme facilitated by the EBRD and the BSAC. Improvements to practices for the prevention and mitigation of AMR will support the objectives of Georgia's NAP on AMR.

In a further show of the EBRD's engagement in tackling AMR, the Bank participated in a US$ 6.4 million loan to Georgia's BioChimPharm under the flagship EU4Busness-EBRD Credit Line.[164] The package supported the modernisation of the company's bacteriophage manufacturing facility, enabling it to attain GMP accreditation.

Bacteriophages,[165] also known as phages, are viruses that specifically target bacteria. Phage therapy[166] involves using phages to treat bacterial infections. In contrast to many antibiotics, each phage targets bacterial strains or species more narrowly, making phage therapy an attractive alternative for managing infections. Modernising BioChimPharm's manufacturing plant in line with GMP will enable it to scale up production and export phage products.

Faced with ever-growing AMR, phage therapy is of increasing global interest to researchers and doctors, with Georgia in a position to contribute to further clinical trials and research.[167]

164 See EU4Business-EBRD Credit Line (n.d.).

165 See Kasman and Porter (2022).

166 See Gordillo Altamirano and Barr (2019).

167 See American Society for Microbiology (2022).

Annex 2. The AMR-climate change-biodiversity loss nexus

The WHO considers AMR to be a key global health issue.[168] Climate change and biodiversity loss are existential threats to planetary and human health. The following is a summary prepared by William Gaze, Abigail Herron and Nobuko Ichikawa, describing how these three global anthropogenic crises combine to create catastrophic risks for humans.[169]

Climate change, biodiversity loss and AMR are vast and complex subjects. Holistic analysis of the interface between them, which goes beyond current work on each subject, is needed to understand their cumulative impacts and synergistic interactions, and to devise mutually beneficial mitigation and adaptation measures, guided by further scientific findings, to inform global policy dialogue.

AMR is impacted by and intertwined with climate change through complex and multidirectional relationships and feedback loops within the biosphere.[170] Biodiversity is adversely affected by anthropogenic impacts and climate change.[171] The links between AMR and biodiversity loss may manifest in soil microbial diversity, which is an essential shield against the spread of AMR,[172] as well as a main source of pharmaceutical discoveries, such as antimicrobial drugs.[173] Ancient evidence reveals that current warming is occurring at roughly 10 times the average rate of warming since the last ice age.[174] One million animal and plant species are now threatened with extinction, many within decades, more than ever before in human history.[175] While AMR is a natural process in the evolution of microbes, the acceleration of its occurrence and spread is driven by anthropogenic impacts – mainly the misuse and overuse of antimicrobials to treat, prevent or control infections in humans, animals and plants in modern times.[176]

Higher temperatures have been identified as an independent variable associated with increased AMR infection. Temperature is a key variable influencing bacterial processes – including horizontal gene transfer, a major mechanism for the acquisition of antibiotic resistance.[177] Storms and floods, the frequency and severity of which are intensified by climate change, are already displacing populations, damaging healthcare services and disrupting wastewater management, leading to more cases of water-borne disease in affected areas. In Pakistan, for example, unprecedented flooding led to a surge in skin and eye infections, diarrhoea, malaria, typhoid and dengue fever in 2022.[178] It is also likely to be associated with the significant spread of AMR bacteria and the transferable genes that confer resistance, as animal and human faeces have contaminated potable water in numerous communities.[179]

Rising global temperatures are changing ecoregions and impacting the resident range of species: this is changing the way different organisms and animals, including vectors such as ticks, fleas, mosquitos, birds and bats, enable pathogens to spread.[180] Research indicates that biodiversity has a protective buffer effect on infectious diseases, as competition controls the population of pathogen hosts and that of microorganisms themselves.[181]

When biodiversity is reduced, there are greater opportunities for zoonoses (whether viral, bacterial, parasitic or fungal), where pathogens emerge from hosts and jump from one species to another. Around 60 per cent of emerging human infections are zoonotic in nature, and of the 30 new human pathogens discovered in the last three decades, 75 per cent have originated in animals.[182] This type of cross-species

168 See WHO (2023b).
169 See Herron (2022).
170 See Fleming Fund (2023).
171 See Jaureguiberry et al. (2022).
172 See Klümper et al. (2024).
173 See Thiele-Bruhn (2021).
174 See NASA (n.d.).
175 See United Nations (2019).
176 See WHO (2023b).
177 See San Lio et al. (2023).
178 See Manzoor and Adesola (2022).
179 See Larsson and Flach (2021).
180 See Environmental Resilience Institute (n.d.).
181 See Keesing et al. (2010).
182 See WHO Eastern Mediterranean Regional Office (n.d.).

disease transmission is thought to have triggered the Covid-19 pandemic.[183]

Deforestation by mining, logging, ranchers, intensive monocrop agriculture and road construction destroys not only carbon sequestration capacity, but also nutrient cycling, which leads to the disturbance of the extraordinary diversity of microorganisms in soil.[184] Melting permafrost due to rising temperatures can unlock gases, such as carbon dioxide and methane, as well as ancient viruses and bacteria.[185] Scientists report that melting Arctic glaciers produce conditions for algae to bloom, turning sun-reflecting glaciers into sun-absorbing hotspots.[186] These, in turn, have ecosystem and geo-planetary impacts, worsening their remaining natural carbon sink function, as well as potentially increasing methane production.[187]

Intensive use of antibiotics in livestock production (which accounts for approximately 70 per cent of global sales),[188, 189] as well as biocides and heavy metals, which can remain in the environment, may reduce microbial biodiversity and induce AMR in bacteria.[190]

The complexity of the AMR-climate change-biodiversity loss nexus requires further scientific research. Meanwhile, if inaction prevails, all three global issues will help bring the world to a point of no return in terms of the unrecoverable depletion of common resources. According to the most recent research (2024), as a result of AMR alone, in a scenario in which countries fail to contain drug resistance, the world could face a staggering US$ 1.7 trillion annual reduction in global economic output in 2050, amounting to a decline of almost 0.9 per cent in GDP, due to the economic impacts of AMR in humans.[191] Greater public awareness; surveillance and laboratory capacity; comprehensively financed NAPs with civil society engagement; access to WASH; IPC; secure access to essential medicines of assured quality and immunisation; the regulated, rational use of medicines, including in animal husbandry; proper patient care; effective diagnostics; and R&D for new antibiotics can all play a part.[192]

Global governing bodies on climate change and biodiversity are already in place. A similar architecture to address AMR needs to be developed urgently based on the landmark political declaration by the second UNGA-HLM on 26 September 2024,[193] the Jeddah Commitments to Accelerate Actions on AMR of 16 November 2024[194] and the QJS and the Global Leaders Group on AMR. An expert body similar to the Intergovernmental Panel on Climate Change (IPCC), the Independent Panel for Evidence on Action Against AMR, will be formed in 2026. As seen in Section 11 on global governance, the political declaration on AMR of 26 September 2024 and the Jeddah Commitments to Accelerate Actions on AMR of 16 November 2024 are critical landmarks in laying the foundations for global architecture to tackle AMR. To convert the political declaration on AMR into concrete action, a ministerial conference and parallel processes, such as the G7 and G20, would be well placed to capitalise on the focus the UNGA-HLM has provided. Cooperation and collaboration by policymakers, industry, investors, academia, international organisations and civil society are required for effective outcomes to address AMR.

183 See WHO (2020).
184 See Timmis (2021).
185 See Denchak (2018).
186 See McDougall (2019).
187 See Topp and Pattey (1997).
188 See Jonas et al. (2017).
189 See Tiseo et al. (2020).
190 See Larsson and Flach (2021).
191 See WOAH and World Bank (2024).
192 See WHO (2016).
193 See UNGA-HLM (2024a).
194 See United Nations (2024).

Annex 3. Recent pharmaceutical investments in Africa

Private investment appears to be tapping the sector's potential, especially in larger African markets. Examples include the following:

- In 2025, the Egyptian International Pharmaceutical Industries Company (EIPICO) opened a new plant for biologics and biosimilar products in partnership with Pharmadule Morimatsu AB, a first for the region.[195]
- In 2022, the Egyptian Ministry of Health signed a memorandum of understanding with Pfizer to transfer technology for the manufacturing of pneumococcal vaccines to Egypt.[196]
- A new SENSYO Pharmatech plant has been built in Morocco for the production of Covid and other vaccines, with the Moroccan government collaborating with a consortium of the country's leading banks and Swedish company Recipharm.[197]
- In 2022, Nigeria and Rwanda introduced a traceability and verification system (TRVST) – a first for Africa – using barcoding technology to verify the authenticity of vaccines (and other products in the future) to ensure patient safety and address the urgent issue of falsified or diverted vaccines.[198]
- In 2022, Ghana launched e-pharmacy access for prescribed medicines, allowing orders to be made with a mobile phone.[199]
- The IFC and the EIB are providing financing to the Institut Pasteur de Dakar to support the construction of a vaccine production facility in Senegal.[200]
- In 2025, the EIB and the European Commission teamed up with BioNTech to help advance a messenger RNA (mRNA) vaccine manufacturing facility in Kigali, Rwanda, for the diseases that matter most to Africa, such as malaria, tuberculosis, HIV and monkey pox.[201]
- The IFC and the AfDB are supporting the construction of Senegal's first multi-vaccine production facility, with other stakeholders mobilising public and philanthropic support for various aspects of the project.[202]
- The Indian firm Glocare Pharma Manufacturing has established a pharmaceutical production plant in the Kilinto Industrial Park in Ethiopia.[203]
- The IFC has provided financing to the Chinese firm Fosun Pharma to help it build a large-scale pharmaceutical production facility for anti-malaria drugs and antibacterial medicines in Côte d'Ivoire, as well as a nearby distribution hub.[204]
- The IFC has provided a joint finance package to South African firm Aspen Pharmaceuticals – Africa's largest pharmaceutical company – to support the company's "Manufacturing in Africa for Africa" initiative in partnership with Novo Nordisk to boost the production and accessibility of critical medicines, including insulin.[205]

195 See https://www.morimatsu-lifesciences.com/list_6/233.html.
196 See Pharma Boardroom (2022).
197 See Africanews (2024) and ANA (2025).
198 See UNICEF (2022).
199 See Pharmacy Council (2024).
200 See IFC (2024).
201 See EIB (2025).
202 See IFC (2025a).
203 See Fortune (2022).
204 See IFC (2023).
205 See IFC (2025a).

Abbreviations and acronyms

AMR	antimicrobial resistance
AMS	antimicrobial stewardship
API	active pharmaceutical ingredient
BSAC	British Society for Antimicrobial Chemotherapy
CDC	US Centers for Disease Control and Prevention
EBRD	European Bank for Reconstruction and Development
ECDC	European Centre for Disease Prevention and Control
EEA	European Economic Area
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDA	US Food and Drug Administration
FPP	finished pharmaceutical product
G7	Group of Seven
G20	Group of 20
GDP	gross domestic product
GIP	good international practice
GLG on AMR	Global Leaders Group on AMR
GMP	good manufacturing practice
IAAMR	Investor Action on Antimicrobial Resistance
IACG	Interagency Coordination Group
IPC	infection prevention and control
LMICs	low- and middle-income countries
MDB	multilateral development bank
NAP	national action plan
OECD	Organisation for Economic Co-operation and Development
PPP	public-private partnership
QJS	Quadripartite Joint Secretariat on AMR
SDG	Sustainable Development Goal
UNCTAD	United Nations Conference on Trade and Development
UNGA-HLM	United Nations General Assembly High-Level Meeting
UNICEF	United Nations Children’s Fund
WAAW	World AMR Awareness Week
WHO	World Health Organization
WOAH	World Organisation for Animal Health

References

AfDB (2022a), *A New Frontier for African Pharmaceutical Manufacturing Industry*, Abidjan. Available at: https://www.afdb.org/en/documents/new-frontier-african-pharmaceutical-manufacturing-industry

AfDB (2022b), "African Pharmaceutical Technology Foundation: Enhancing technology access and transfer for domestic manufacturing in Africa", Abidjan. Available at: https://www.afdb.org/en/news-and-events/events/african-pharmaceutical-technology-foundation-enhancing-technology-access-and-transfer-domestic-manufacturing-africa-57328

Africa CDC (2024), *Voicing African Priorities on the Active Pandemic: Accelerating the Continental Response to Antimicrobial Resistance*, Addis Ababa. Available at: https://africacdc.org/wp-content/uploads/2024/08/African-Union-AMR-Landmark-Report-.pdf

Africa CDC (2025), "Africa CDC urges immediate action to protect lives amid escalating health and security crises", Addis Ababa. Available at: https://africacdc.org/news-item/africa-cdc-urges-immediate-action-to-protect-lives-amid-escalatinghealth-and-security-crises

African Export-Import Bank (2022), *Industry Outlook 2022: Pharmaceuticals & Healthcare*, Cairo. Available at: https://media.afreximbank.com/afrexim/Pharmaceuticals_Industry-Report-2022.pdf

Africanews (2024), "Morocco starts construction of vaccine manufacturing plant", 13 August 2024. Available at: https://www.africanews.com/2022/01/28/morocco-starts-construction-of-vaccine-manufacturing-plant

American Society for Microbiology (2022), "Phage Therapy: Past, Present and Future", 31 August 2022. Available at: https://asm.org/articles/2022/august/phage-therapy-past,-present-and-future

AMR Industry Alliance (n.d.), "AMR Industry Alliance", Geneva, Switzerland. Available at: https://www.amrindustryalliance.org

AMR Industry Alliance (2022), *Antibiotic manufacturing standard: Minimizing risk of developing antibiotic resistance and aquatic ecotoxicity in the environment resulting from the manufacturing of human antibiotics*, Geneva, Switzerland. Available at: https://www.amrindustryalliance.org/antibiotic-manufacturing-standard

ANA (2025), "Marbio: first 'Made in Morocco' vaccine ready soon", 16 February 2025. Available at: https://africa-news-agency.com/marbio-first-made-in-morocco-vaccine-ready-soon

Antimicrobial Resistance Collaborators (2022), "Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis", *The Lancet*, 399(10325): 629-655. Available at: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)02724-0/fulltext

C. Ardal, M. Gawad, E. Baraldi, M. Jahre and C. Edlund (2024), "Fragmented markets for older antibiotics and child formulations, Denmark, Norway, Sweden", *Bulletin of the World Health Organization*, 103(1): 51-56. Available at: https://www.researchgate.net/publication/387864280_Fragmented_markets_for_older_antibiotics_and_child_formulations_Denmark_Norway_Sweden

M. Balasegaram (2023), "Antibiotic shortages are fueling antimicrobial resistance", Gavi, 24 November 2023. Available at: https://www.gavi.org/vaccineswork/antibiotic-shortages-are-fueling-antimicrobial-resistance

R. Blaney, E. Handy, A. Wawrzyniak and R. Dirkzwager (2023), "EU Pharma Legislation Review Series: Regulatory Data Protection", *Inside EU Life Sciences*, Covington, London. Available at: https://www.insideeulifesciences.com/2023/04/26/eu-pharma-legislation-review-series-regulatory-data-protection

BSAC (2021), "Global Antimicrobial Stewardship Accreditation Scheme", Birmingham, United Kingdom. Available at: https://bsac.org.uk/global-antimicrobial-stewardship-accreditation-scheme

CDDEP (2019), *Access Barriers to Antibiotics*, Washington, DC. Available at: https://onehealthtrust.org/wp-content/uploads/2019/04/AccessBarrierstoAntibiotics_CDDEP_FINAL.pdf

Charles River Associates (2023), "Strengthening the sustainability of the off-patent antibiotic supply chain", report prepared for the AMR Industry Alliance. Available at: https://www.amrindustryalliance.org/wp-content/uploads/2023/02/CRA-AMR-Industry-Alliance-Sustainability-Framework-Report-FINAL.pdf

C. Dall (2024), "UK's NHS to require companies to meet responsible antibiotic manufacturing standard", CIDRAP, University of Minnesota, 13 August 2024. Available at: https://www.cidrap.umn.edu/antimicrobial-stewardship/uks-nhs-require-companies-meet-responsible-antibiotic-manufacturing

M. Denchak (2018), "Permafrost: Everything You Need to Know", Natural Resources Defense Council, New York. Available at: https://www.nrdc.org/stories/permafrost-everything-you-need-know

S.E. Dogan (2024), "Explained: the history of progress in tackling antimicrobial resistance", Wellcome, 3 September 2024. Available at: https://wellcome.org/news/explained-history-progress-tackling-antimicrobial-resistance

EBRD (2021), "EBRD-FAO Framework (2019 extension)", London. Available at: https://www.ebrd.com/work-with-us/projects/tcpsd/12330.html

EBRD (2024a), *Environmental and Social Policy*, London. Available at: https://www.ebrd.com/environmental-and-social-policy-esp-2024

EBRD (2024b), *Sustainability Report 2023*, London. Available at: https://www.ebrd.com/sustainability-report-2023.html

ECDC (2022), *Antimicrobial Resistance in the EU/EEA – A One Health response*, Solna, Sweden. Available at: https://www.ecdc.europa.eu/en/publications-data/antimicrobial-resistance-eueea-one-health-response

ECDC and WHO European Region (2023), *Surveillance of antimicrobial resistance in Europe, 2022 data: executive summary*, Solna, Sweden, and Copenhagen. Available at: https://www.ecdc.europa.eu/sites/default/files/documents/Nov2023-ECDC-WHO-Executive-Summary.pdf

EIB (2025), "EIB and European Commission join forces with BioNTech to build a sustainable vaccine ecosystem in Africa", 13 October 2025, Luxembourg. Available at: https://www.eib.org/en/press/all/2025-380-eib-and-european-commission-join-forces-with-biontech-to-build-a-sustainable-vaccine-ecosystem-in-africa

Environmental Resilience Institute (n.d.), "Climate Implications – Mosquitoes, Ticks, and Other Vectors", Indiana University, Bloomington, IN. Available at: https://eri.iu.edu/erit/implications/mosquitoes-ticks-and-other-vectors.html

EU4Business-EBRD Credit Line (n.d.), "EU4Business-EBRD Credit Line", Chisinau. Available at: https://www.eu4business-ebrdcreditline.md

European Antimicrobial Resistance Collaborators (2022), "The burden of bacterial antimicrobial resistance in the WHO European region in 2019: a cross-country systematic analysis", *The Lancet*, 7(11): e897-e913. Available at: https://www.research.ed.ac.uk/en/publications/the-burden-of-bacterial-antimicrobial-resistance-in-the-who-europ

European Commission (n.d.a), "Farm to Fork Strategy", Brussels. Available at: https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en

European Commission (n.d.b), "Antimicrobial Resistance: Research, Projects & Studies", Brussels. Available at: https://health.ec.europa.eu/antimicrobial-resistance/research-projects-studies_en

European Commission (2010), "Commission Communication – EU best practice guidelines for voluntary certification schemes for agricultural products and foodstuffs (2010/C 341/04)", *Official Journal of the European Union*, 16 December 2010. Available at: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:341:0005:0011:en:PDF

European Commission (2023), *Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach*, Brussels. Available at: https://health.ec.europa.eu/publications/council-recommendation-stepping-eu-actions-combat-antimicrobial-resistance-one-health-approach_en

European Commission (2024), "Update on AMR-related issues in several environmental policy contexts", Brussels. Available at: https://ec.europa.eu/assets/sante/health/amr/docs/amr_20240229_co04_en.pdf

European Court of Auditors (2025), "Special report 19/2025: Critical shortages of medicines – EU measures were of added value, but structural problems remain", Luxembourg. Available at: https://www.eca.europa.eu/en/publications?ref=SR-2025-19

European Food Safety Authority (2024), *Data collection on antibiotics for control of plant pathogenic bacteria*, Parma, Italy. Available at: https://www.efsa.europa.eu/en/supporting/pub/en-8522

European Union (2018), *Regulation (EU) 2019/6 of the European Parliament and of the Council of 11 December 2018 on veterinary medicinal products and repealing Directive 2001/82/EC*, Brussels. Available at: https://eur-lex.europa.eu/eli/reg/2019/6/oj

European Union (2019), *Regulation (EU) 2019/4 of the European Parliament and of the Council of 11 December 2018 on the manufacture, placing on the market and use of medicated feed, amending Regulation (EC) No 183/2005 of the European Parliament and of the Council and repealing Council Directive 90/167/EEC*, Brussels. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32019R0004

European Union (2021), *Community strategy against antimicrobial resistance*, Brussels. Available at: https://eur-lex.europa.eu/EN/legal-content/summary/community-strategy-against-antimicrobial-resistance.html

FAIRR (2024), *Health and Wealth: The Investors' Guide to Antimicrobial Resistance (AMR), A Growing Global Health Crisis*, London. Available at: https://www.fairr.org/resources/reports/health-and-wealth-the-investors-guide-to-antimicrobial-resistance

FAO (2022), "Antimicrobial resistance: Now is the time for collective action", Rome. Available at: https://www.fao.org/newsroom/detail/antimicrobial-resistance-now-is-the-time-for-collective-action/en

FAO Investment Centre (2024), "Helping minimize the misuse of antibiotics in farmed poultry in Ukraine", Rome. Available at: https://www.fao.org/investment-centre/latest/news/detail/helping-minimize-the-misuse-of-antibiotics-in-farmed-poultry-in-ukraine/en

A.A. Fayad, A. Rizk, S. El Sayed, M. Kaddoura, N.K. Jawad, A. Al-Attar, O. Dewachi, V.K. Nguyen and Z.A. Sater (2023), "Antimicrobial resistance and the Iraq wars: armed conflict as an underinvestigated pathway with growing significance", *BMJ Global Health*, 7 (Suppl 8): e010863. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC9933488

FDA (2019), "Drug shortages: Root causes and potential solutions", Silver Spring, Maryland. Available at: https://www.fda.gov/media/132058/download

Financial Times (2025), "Europe's last maker of key antibiotics ingredients shuts biggest domestic factory", 6 May 2025. Available at: https://www.ft.com/content/4b9684e4-72da-49e9-b11b-abe8a20b9507

M.C. Fisher, A. Alastruey-Izquierdo, J. Berman, T. Bicanic, E.M. Bignell, P. Bowyer et al. (2022), "Tackling the emerging threat of antifungal resistance to human health", *Nature Reviews Microbiology*, 20(9): 557-571. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC8962932

Fleming Fund (2023), "First line of defence for AMR One Health must address the climate crisis", 4 July 2023. Available at: https://www.flemingfund.org/publications/the-first-line-of-defence-for-amr-one-health-must-address-the-climate-crisis

Fortune (2022), "Indian Pharmaceutical Inaugurates $5m Plant at Kilinto Park", 12 March 2022, Addis Ababa. Available at: https://addisfortune.news/indian-pharmaceutical-inaugurates-5m-plant-at-kilinto-park

G20 (2019), *Okayama Declaration of the G20 Health Ministers*, Okayama, Japan. Available at: https://www.mhlw.go.jp/seisakunitsuite/bunya/hokabunya/kokusai/g20/health/jp/img/G20Okayama_HM_EN.pdf

G20 Brazil (2024), "Sherpa Track: Health", Brasilia. Available at: https://g20.gov.br/en/documents/sherpa-track

A.K. Gautam and S. Kumar (2020), "Techniques for the Detection, Identification, and Diagnosis of Agricultural Pathogens and Diseases", in C. Egbuna and B. Sawicka (eds.), *Natural Remedies for Pest, Disease and Weed Control*, Elsevier Inc. Available at: https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/plant-pathogenic-bacteria

R. Gauzit and M. Lakdhari (2012), "Generic antibiotic drugs: Is effectiveness guaranteed?", *Médecine et Maladies Infectieuses*, 42(4): 141-8. Available at: https://www.researchgate.net/publication/223962526_Generic_antibiotic_drugs_Is_effectiveness_guaranteed

GBD 2019 Antimicrobial Resistance Collaborators (2022), "Global mortality associated with 33 bacterial pathogens in 2019: a systematic analysis for the Global Burden of Disease Study 2019", *The Lancet*, 400(10369): 2221-2248. Available at: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(22)02185-7/fulltext

GBD 2021 Antimicrobial Resistance Collaborators (2024), "Global burden of bacterial antimicrobial resistance 1990-2021: a systematic analysis with forecasts to 2050", *The Lancet*, 404(10459): 1199-1226. Available at: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(24)01867-1/fulltext

Global AMR R&D Hub (2024), "Hub-WHO Joint G7 Progress Report Published", 18 October 2024. Available at: https://globalamrhub.org/news/hub-who-joint-g7-progress-report-published

Global Leaders Group on Antimicrobial Resistance (n.d.), "Global Leaders Group on Antimicrobial Resistance". Available at: https://www.amrleaders.org

Global Leaders Group on Antimicrobial Resistance (2024), *Towards Specific Commitments and Action in Response to AMR: Recommendations for consideration by UN Member States in the outcome document of the High-level Meeting on AMR in September 2024*. Available at: https://www.amrleaders.org/resources

F.L. Gordillo Altamirano and J.J. Barr (2019), "Phage Therapy in the Postantibiotic Era", *Clinical Microbiology Reviews*, 32(2). Available at: https://journals.asm.org/doi/10.1128/cmr.00066-18

Government of the United Kingdom (2024), *UK 5-year action plan for antimicrobial resistance 2024 to 2029*, London. Available at: https://www.gov.uk/government/publications/uk-5-year-action-plan-for-antimicrobial-resistance-2024-to-2029

Grand View Research (2025), *Antibiotics Market (2025-2033)*, San Francisco. Available at: https://www.grandviewresearch.com/industry-analysis/antibiotic-market

Z. Han, H. Feng, C. Wang, X. Wang, M. Yang and Y. Zhang (2023), "Mitigating Antibiotic Resistance Emissions in the Pharmaceutical Industry: Global Governance and Available Techniques", *China CDC Weekly*, 5(46): 1038-1044. Available at: https://pubmed.ncbi.nlm.nih.gov/38046642

V. Haralampieva and A. Herrera-Martínez (2025), "Chapter 4: Multilateral development banks and their role in channelling climate finance", in M. Mehling and H. van Asselt (eds.), *Research Handbook on Climate Finance and Investment Law*, Edward Elgar Publishing. Available at: https://www.elgaronline.com/edcollbook/book/9781789905403/9781789905403.xml

A. Herron (2022), "Confronting a permacrisis? The intersection between antimicrobial resistance, climate change and biodiversity loss", Aviva Investors, 23 November 2022. Available at: https://www.avivainvestors.com/en-gb/views/aiq-investment-thinking/2022/11/antimicrobial-resistance

M. Hutchings, A.W. Truman and B. Wilkinson (2019), "Antibiotics: past, present and future", *Current Opinion in Microbiology*, 51: 72-80. Available at: https://pubmed.ncbi.nlm.nih.gov/31733401

IFC (n.d.), "IFC's Work in Health", Washington, DC. Available at: https://www.ifc.org/en/what-we-do/sector-expertise/health

IFC (2023), "IFC Supports Fosun Pharma's Construction of Largest Pharmaceuticals Factory in Côte d'Ivoire", 5 June 2023, Washington, DC. Available at: https://www.ifc.org/en/pressroom/2023/ifc-supports-fosun-pharmas-construction-of-largest-pharmaceutica

IFC (2024), "IFC and Partners Support Institut Pasteur de Dakar to Boost Vaccine Manufacturing for Africa", 13 December 2024, Washington, DC. Available at: https://www.ifc.org/en/pressroom/2024/ifc-and-partners-support-institut-pasteur-de-dakar-to-boost-vaccine-manufacturing-for-africa

IFC (2025a), "Answering Africa's Call for Private Investment in Pharma Manufacturing", 24 July 2025, Washington, DC. Available at: https://www.ifc.org/en/stories/2025/answering-africas-call-for-private-investment-in-pharma-manufacturing

IFC (2025b), *The International Finance Corporation's Investments in the Pharmaceutical and Life Sciences Sector: Findings from Clustered Project Performance Assessment Reports*, Washington, DC. Available at: https://ieg.worldbankgroup.org/evaluations/ifc-investments-pharmaceutical-and-life-sciences-sector

Institute for Economic Justice (2022), *The Localisation of Medical Manufacturing in Africa*, Johannesburg. Available at: https://www.iej.org.za/wp-content/uploads/2022/11/IEJ-LoMMiA-report_Nov2022.pdf

Investor Action on AMR (n.d.), "Investor Action on Antimicrobial Resistance". Available at: https://amrinvestoraction.org

Investor Action on AMR (2024), "US $13 Trillion Investors Call on Global Leaders To Tackle Antimicrobial Resistance Crisis", 3 September 2024. Available at: https://amrinvestoraction.org/article/usd13-trillion-investors-call-on-global-leaders-to-tackle-antimicrobial-resistance-crisis

S. Janković (2024), "Subscription model for antimicrobials could be expanded in new UK five-year AMR plan", *The Pharmaceutical Journal*, 9 May 2024. Available at: https://pharmaceutical-journal.com/article/news/subscription-model-for-antimicrobials-could-be-expanded-in-new-uk-five-year-amr-plan

P. Jaureguiberry, N. Titeux, M. Wiemers, D.E. Bowler, L. Coscieme, A.S. Golden et al. (2022), "The direct drivers of recent global anthropogenic biodiversity loss", *Science Advances*, 8(45). Available at: https://www.science.org/doi/10.1126/sciadv.abm9982

O.B. Jonas, A. Irwin, F.C.J. Berthe, F.G. Le Gall and P.V. Marquez (2017), *Drug-resistant infections: a threat to our economic future (Vol. 2): final report*, World Bank, Washington, DC. Available at: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/323311493396993758/final-report

L.M. Kasman and L.D. Porter (2022), *Bacteriophages*, StatPearls Publishing, Treasure Island, FL. Available at: https://www.ncbi.nlm.nih.gov/books/NBK493185

F. Keesing, L.K. Belden, P. Daszak, A. Dobson, C.D. Harvell, R.D. Holt et al. (2010), "Impacts of biodiversity on the emergence and transmission of infectious diseases", *Nature*, 468: 647-652. Available at: https://www.nature.com/articles/nature09575

M. Kizito, D. Owachi, F. Lule, L. Jung, V. Bazanye, I. Mugerwa, S. Nabadda and C. Kabugo (2025), "Antibiotic consumption and utilization at a large tertiary care level hospital in Uganda: A point prevalence survey", *PLoS One*, 20(1): e0313587. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC11723590

U. Klümper, G. Gionchetta, E. Catão, X. Bellanger, I. Dielacher, A.X. Elena et al. (2024), "Environmental microbiome diversity and stability is a barrier to antimicrobial resistance gene accumulation", *Communications Biology*, 7(706). Available at: https://www.nature.com/articles/s42003-024-06338-8

D.G.J. Larsson and C.-F. Flach (2021), "Antibiotic resistance in the environment", *Nature Reviews Microbiology*, 20: 257-269. Available at: https://www.nature.com/articles/s41579-021-00649-x

C. Lim, I. Pauwels, H.Q. Nguyen, W. Cuningham, M. Thorn, A. Cook, M.M.M. Swe, B.S. Cooper, B. Huttner, Y. Hsia, C.E. Moore, E. Vlieghe, K.B. Pouwels, A. Versporten and M. Sharland (2025), "Using oral and parenteral formulation of AWaRe antibiotics as a proxy estimate of primary healthcare and inpatient hospital sector use", preprint. Available at: https://www.medrxiv.org/content/10.1101/2025.11.05.25339617v1.full

C. Llor and L. Bjerrum (2014), "Antimicrobial resistance: risk associated with antibiotic overuse and initiatives to reduce the problem", *Therapeutic Advances in Drug Safety*, 5(6): 229-241. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC4232501

G. Loban, M. Faustova, O. Dobrovolska and P. Tkachenko (2023), "War in Ukraine: incursion of antimicrobial resistance", *Irish Journal of Medical Science*, 192(6): 2905-2907. Available at: https://pubmed.ncbi.nlm.nih.gov/37178279

A. Manzoor and R.O. Adesola (2022), "Disaster in public health due to flood in Pakistan in 2022", *Health Science Reports*, 5(6): e903. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC9584091

A. McDonnell and K. Klemperer (2022), *Drug-Resistant Infections Are One of the World's Biggest Killers, Especially for Children in Poorer Countries. We Need to Act Now*, Center for Global Development, Washington, DC and London. Available at: https://www.cgdev.org/blog/drug-resistant-infections-are-one-worlds-biggest-killers-especially-children-poorer-countries

D. McDougall (2019), "The tiny algae at ground zero of Greenland's melting glaciers", *The Guardian*, 18 September 2019. Available at: https://www.theguardian.com/environment/2019/sep/18/tiny-algae-ground-zero-greenland-melting-glaciers

McKinsey & Company (2019), "Should sub-Saharan Africa make its own drugs?", 10 January 2019. Available at: https://www.mckinsey.com/industries/public-sector/our-insights/should-sub-saharan-africa-make-its-own-drugs

K. Moussally, G. Abu-Sittah, F. Gordillo Gomez, A.A. Fayad and A. Farra (2023), "Antimicrobial resistance in the ongoing Gaza war: a silent threat", *The Lancet*, 402(10416): P1972-1973. Available at: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(23)02508-4/fulltext

R. Mulchandani, Y. Wang, M. Gilbert and T.P. Van Boeckel (2023), "Global trends in antimicrobial use in food-producing animals: 2020 to 2030", *PLOS Global Public Health*, 3(2): e0001305. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC10021213

NASA (n.d.), "Evidence", Washington, DC. Available at: https://science.nasa.gov/climate-change/evidence

M. Ndomondo-Sigonda, J. Miot, S. Naidoo, A. Dodoo and E. Kaale (2017), "Medicines Regulation in Africa: Current State and Opportunities", *Pharmaceutical Medicine*, 31(6): 383-397. Available at: https://pubmed.ncbi.nlm.nih.gov/29200865

OECD (2023), *Embracing a One Health Framework to Fight Antimicrobial Resistance*, Paris. Available at: https://www.oecd.org/en/publications/embracing-a-one-health-framework-to-fight-antimicrobial-resistance_ce44c755-en.html

J. Olivera and W.C. Reygaert (2024), *Gram-Negative Bacteria*, StatPearls Publishing, Treasure Island, FL. Available at: https://www.ncbi.nlm.nih.gov/books/NBK538213

I.I. Otaigbe (2025), "Mitigating inequitable access to appropriate antibiotics in low- and middle-income countries", *JAC Antimicrobial Resistance*, 7(2). Available at: https://academic.oup.com/jacamr/article/7/2/dlaf061/8118976

S.J.C. Pallett, S.E. Boyd, M.K. O'Shea, J. Martin, D.R. Jenkins and E.J. Hutley (2023), "The contribution of human conflict to the development of antimicrobial resistance", *Communications Medicine (London)*, 3(1): 153. Available at: https://pubmed.ncbi.nlm.nih.gov/37880348

D. Panteli, M. Anderson, T. Fieldman, E. Baraldi, T. Tängdén, S. Vogler, C. Årdal and E. Mossialos (2024), "Policy options for sustainable access to off-patent antibiotics in Europe", *npj Antimicrobials and Resistance*, 2, article no. 40. Available at: https://www.nature.com/articles/s44259-024-00061-4

N. Petrosillo, E. Petersen and S. Antoniak (2023), "Ukraine war and antimicrobial resistance", *The Lancet Infectious Diseases*, 24(6): 653-654. Available at: https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(23)00264-5/fulltext

Pharma Boardroom (2022), "Pfizer's Pneumococcal Vaccine Tech Transfer MoU in Egypt: What Impact?", 10 October 2022. Available at: https://pharmaboardroom.com/articles/pfizers-pneumococcal-vaccine-tech-transfer-mou-in-egypt-what-impact

Pharmacy Council (2024), "From Queues to Clicks: Ghana embraces e-pharmacies to serve patients better", 28 December 2024, Accra. Available at: https://pcghana.org/from-queues-to-clicks-ghana-embraces-e-pharmacies-to-serve-patients-better

S.I. Polianciuc, A.E. Gurzău, B. Kiss, M.G. Stefan and F. Loghin (2020), "Antibiotics in the environment: causes and consequences", *Medicine and Pharmacy Reports*, 93(3): 231-240. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC7418837

F. Prestinaci, P. Pezzotti and A. Pantosti (2015), "Antimicrobial resistance: a global multifaceted phenomenon", *Pathogens and Global Health*, 109(7): 309-318. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC4768623

ReAct (n.d.), "Global Policy", Uppsala, Sweden. Available at: https://www.reactgroup.org/toolbox/policy/global-policy

M. Ren, A.D. So, S.J. Chandy, M. Mpundu, A.O. Peralta, K. Åkerfeldt, A.K. Sjöblom and O. Cars (2022), "Equitable Access to Antibiotics: A Core Element and Shared Global Responsibility for Pandemic Preparedness and Response", *Journal of Law, Medicine and Ethics*, 50(S2): 34-39. Available at: https://pubmed.ncbi.nlm.nih.gov/36889350

H. Ritchie (2017), "Three-quarters of antibiotics are used on animals. Here's why that's a major problem", World Economic Forum, Geneva, Switzerland. Available at: https://www.weforum.org/stories/2017/11/three-quarters-of-antibiotics-are-used-on-animals-heres-why-thats-a-major-problem

Royal Society of Chemistry (2024), *Position Statement: Antimicrobial Resistance*, London. Available at: https://www.rsc.org/globalassets/22-new-perspectives/health/our-policy-position-antimicrobial-resistance.pdf

Safeguarding Health in Conflict (2024), "2023 Attacks on Health Care in War Zones Most Ever Documented", 22 May 2024, Geneva, Switzerland. Available at: https://insecurityinsight.org/wp-content/uploads/2024/05/2023-SHCC-Press-Release-Critical-Conditions.pdf

A.I. Samreen, H.A. Malak and H.H. Abulreesh (2021), "Environmental antimicrobial resistance and its drivers: a potential threat to public health", *Journal of Global Antimicrobial Resistance*, 27: 101-111. Available at: https://www.sciencedirect.com/science/article/pii/S2213716521001910

R.M. San Lio, G. Favara, A. Maugeri, M. Barchitta and A. Agodi (2023), "How Antimicrobial Resistance Is Linked to Climate Change: An Overview of Two Intertwined Global Challenges", *International Journal of Environmental Research and Public Health*, 20(3): 1681. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC9914631

T. Schultze, M. Hogardt, E.S. Velázquez, D. Hack, S. Besier, T.A. Wichelhaus, U. Rochwalsky, V.A.J. Kempf and C. Reinheimer (2023), "Molecular surveillance of multidrug-resistant Gram-negative bacteria in Ukrainian patients, Germany, March to June 2022", *Euro Surveillance*, 28(1): 2200850. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC9817211

N. Shafiq, A. Kumar Pandey, S. Malhotra, M. Mendelson, R. Malpani, M. Balasegaram and E. Charani (2021), "Shortage of essential antimicrobials: a major challenge to global health security", *BMJ Global Health*, 6(11): e006961. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC8565534

M. Sharland, A. Cook, K.B. Pouwels, A. McDonnell, R. Laxminarayan, W. Hope, J. Bielicki, S. Davies, M. Balasegaram, J. Cohn, N. Magrini, G. Dedet, H. Sati, A. Cameron and B. Huttner (2024), "Universal access to key essential antibiotics – Recent amoxicillin global shortages mask a wider policy failure", *CMI Communications*, 1(2). Available at: https://www.sciencedirect.com/science/article/pii/S2950590924050352

M. Sharland, V. Zanichelli, L.A. Ombajo, J. Bazira, B. Cappello, R. Chitatanga, P. Chuki, S. Gandra, H. Getahun, S. Harbarth, M. Loeb, M. Mendelson, L. Moja, C. Pulcini, H. Sati, E. Tacconelli, M. Zeng and B. Huttner (2022), "The WHO essential medicines list AWaRe book: from a list to a quality improvement system", *Clinical Microbiology and Infection*, 28(12): 1533-1535. Available at: https://www.sciencedirect.com/science/article/pii/S1198743X22004256

B. Skender and M. Zhang (2024), "From local issue to global challenge: a brief overview of antibiotic shortages since the 1970s", *Humanities and Social Sciences Communications*, 11, article no. 1242. Available at: https://www.nature.com/articles/s41599-024-03759-y

D. Stepanskyi, O. Ishchenko, T. Luo, F. Lebreton, J.W. Bennett, I. Kovalenko and P. McGann (2024), "Phenotypic and genomic analysis of bacteria from war wounds in Dnipro, Ukraine", *JAC-Antimicrobial Resistance*, 6(3): dlae090. Available at: https://pubmed.ncbi.nlm.nih.gov/38872715

P. Taylor and R. Reeder (2020), "Antibiotic use on crops in low and middle-income countries based on recommendations made by agricultural advisors", *CABI Agriculture and Bioscience*, 1(1). Available at: https://cabiagbio.biomedcentral.com/articles/10.1186/s43170-020-00001-y

A.A. Tegegne, A.B. Feissa, G.H. Godena, Y. Tefera, H.K. Hassen, Y. Ozalp and S. Suleman (2024), "Substandard and falsified antimicrobials in selected east African countries: A systematic review", *PLoS One*, 19(1): e0295956. Available at: https://pubmed.ncbi.nlm.nih.gov/38277385

The Lancet (2024), "Infographics: Antimicrobial resistance: an enormous, growing, and unevenly distributed threat to global health", AMR series, 23 May 2024. Available at: https://www.thelancet.com/infographics-do/antibiotic-resistance-series-2024

S. Thiele-Bruhn (2021), "The role of soils in provision of genetic, medicinal and biochemical resources", *Philosophical Transactions of the Royal Society B: Biological Sciences*, 376: 20200183. Available at: https://royalsocietypublishing.org/doi/10.1098/rstb.2020.0183

Third Global High-Level Ministerial Conference on Antimicrobial Resistance (2022), "The Muscat Ministerial Manifesto on AMR", Muscat, Oman. Available at: https://vets.blog.gov.uk/2023/05/05/welcoming-the-muscat-manifesto-putting-amr-at-the-top-of-global-agendas

K. Timmis (2021), "The soil crisis: the need to treat as a global health problem and the pivotal role of microbes in prophylaxis and therapy", *Microbial Biology*, 14(3): 769-797. Available at: https://enviromicro-journals.onlinelibrary.wiley.com/doi/full/10.1111/1751-7915.13771

K. Tiseo, L. Huber, M. Gilbert, T.P. Robinson and T.P. Van Boeckel (2020), "Global Trends in Antimicrobial Use in Food Animals from 2017 to 2030", *Antibiotics*, 9(12): 918. Available at: https://www.mdpi.com/2079-6382/9/12/918

E. Topp and E. Pattey (1997), *Soils as sources and sinks for atmospheric methane*, Centre for Land and Biological Resources Research, Agriculture and Agri-Food Canada, Ottawa. Available at: https://cdnsciencepub.com/doi/pdf/10.4141/S96-107

V. Totaro, G. Guido, S. Cotugno, E. De Vita, M. Asaduzzaman, G. Patti, F.V. Segala, G. Putoto, L. Frallonardo, F. Balázs Farkas, B. Lakatos, N. Veronese, P. Locantore, F. Di Gennaro and A. Saracino (2025), "Antimicrobial Resistance in Sub-Saharan Africa: A Comprehensive Landscape Review", *The American Journal of Tropical Medicine and Hygiene*, 113(2): 253-263. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC12360106

Turkish Ministry of Health (2022), "Sağlık Bakanlığı Antimikrobiyal Direnç Önleme Eğitimi" (Ministry of Health Antimicrobial Resistance Prevention Training), *YouTube*, 23 June 2022. Available at: https://www.youtube.com/watch?v=Nihmr5Gqg5Y

UNCTAD (2023), *Improving the investment landscape for local production of essential antibiotics in Ethiopia: An Advisory Report*, Geneva, Switzerland. Available at: https://unctad.org/publication/improving-investment-landscape-local-production-essential-antibiotics-ethiopia-advisory

UNCTAD (2025a), *Building the case for investment in local pharmaceutical production in Africa: A comprehensive framework for investment policymakers*, Geneva, Switzerland. Available at: https://unctad.org/system/files/official-document/diae2024d5_en.pdf

UNCTAD (2025b), *Attracting pharmaceutical manufacturing to Africa's special economic zones*, Geneva, Switzerland. Available at: https://unctad.org/publication/attracting-pharmaceutical-manufacturing-africas-special-economic-zones

UNGA-HLM (2024a), *Political Declaration of the High-Level Meeting on Antimicrobial Resistance*, New York. Available at: https://www.un.org/pga/wp-content/uploads/sites/108/2024/09/FINAL-Text-AMR-to-PGA.pdf

UNGA-HLM (2024b), "UN General Assembly High-Level Meeting on antimicrobial resistance 2024", 26 September 2024, New York. Available at: https://www.who.int/news-room/events/detail/2024/09/26/default-calendar/un-general-assembly-high-level-meeting-on-antimicrobial-resistance-2024

UNICEF (2022), "First serialized vaccine scan in Africa marks milestone in tackling falsified medical products", Copenhagen. Available at: https://www.unicef.org/supply/stories/first-serialized-vaccine-scan-africa-marks-milestone-tackling-falsified-medical-products

United Nations (2019), "UN Report: Nature's Dangerous Decline 'Unprecedented'; Species Extinction Rates 'Accelerating'", New York. Available at: https://www.un.org/sustainabledevelopment/blog/2019/05/nature-decline-unprecedented-report

United Nations (2024), "Jeddah conference closes with adoption of global pledges to tackle antimicrobial resistance", 16 November 2024, Jeddah. Available at: https://news.un.org/en/story/2024/11/1157091

United Nations Statistics Division (2024), *The Sustainable Development Goals Report 2024*, New York. Available at: https://unstats.un.org/sdgs/report/2024

USP (2022), "Supply chain vulnerabilities exist for antimicrobial medicines: USP Medicine Supply Map analysis", 24 May 2022. Available at: https://qualitymatters.usp.org/supply-chain-vulnerabilities-for-antimicrobial-medicines

WaterAid (2024), "Sub-Saharan Africa left to pick up $8.4 billion cost of healthcare infections", London. Available at: https://www.wateraid.org/uk/media/sub-saharan-africa-left-to-pick-up-84-billion-cost-of-healthcare-infections

Wellcome (2023), "Why is it so hard to develop new antibiotics?", London. Available at: https://wellcome.org/news/why-is-it-so-hard-develop-new-antibiotics

Wellcome (2024), *Driving action on antimicrobial resistance (AMR) in 2024: Policy briefing*, London. Available at: https://cms.wellcome.org/sites/default/files/2024-05/driving-action-on-antimicrobial-resistance-in-2024.pdf

Wellcome and Boston Consulting Group (2022), *Understanding the antibiotic manufacturing ecosystem*, London. Available at: https://cms.wellcome.org/sites/default/files/2022-04/understanding-the-antibiotic-manufacturing-ecosystem-2022.pdf

WHO (n.d.), "One Health", Geneva, Switzerland. Available at: https://www.who.int/health-topics/one-health

WHO (2001), *WHO Global Strategy for Containment of Antimicrobial Resistance*, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/66860/WHO_CDS_CSR_DRS_2001.2.pdf

WHO (2016), *Global action plan on antimicrobial resistance*, Geneva, Switzerland. Available at: https://www.who.int/publications/i/item/9789241509763

WHO (2017), *WHO guidelines on use of medically important antimicrobials in food-producing animals*, Geneva, Switzerland. Available at: https://www.who.int/publications/i/item/9789241550130

WHO (2020), *Origin of SARS-CoV-2*, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/332197/WHO-2019-nCoV-FAQ-Virus_origin-2020.1-eng.pdf

WHO (2023a), "AWaRe classification of antibiotics for evaluation and monitoring of use", Geneva, Switzerland. Available at: https://www.who.int/publications/i/item/WHO-MHP-HPS-EML-2023.04

WHO (2023b), "Antimicrobial resistance", Geneva, Switzerland. Available at: https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance

WHO (2023c), *Tracking universal health coverage: 2023 global monitoring report*, Geneva, Switzerland. Available at: https://www.who.int/publications/i/item/9789240080379

WHO (2024), "New global guidance aims to curb antibiotic pollution from manufacturing", Geneva, Switzerland. Available at: https://www.who.int/news/item/03-09-2024-new-global-guidance-aims-to-curb-antibiotic-pollution-from-manufacturing

WHO (2025a), *Global antibiotic resistance surveillance report 2025*, Geneva, Switzerland. Available at: https://www.who.int/publications/i/item/9789240116337

WHO (2025b), "WHO Model List of Essential Medicines", 24th list, Geneva, Switzerland. Available at: https://www.who.int/publications/i/item/B09474

WHO (2025c), *Global Antimicrobial Resistance and Use Surveillance System (GLASS) report: antibiotic use data for 2022*, Geneva, Switzerland. Available at: https://www.who.int/publications/i/item/9789240108127

WHO African Region (2024), *Framework for strengthening local production of medicines, vaccines, and other health technologies in the WHO African Region 2025-2035: Report of the Secretariat*, Brazzaville, Republic of the Congo. Available at: https://www.afro.who.int/sites/default/files/2024-07/AFR-RC74-6%20Framework%20for%20strengthening%20local%20production%20of%20medicines,%20vaccines%20and%20other%20health%20technologies%20in%20the%20WHO%20African%20Region.pdf

WHO African Region (2025), "Africa sets course for affordable, quality medicines with new 10-year roadmap", Brazzaville, Republic of the Congo. Available at: https://www.afro.who.int/news/africa-sets-course-affordable-quality-medicines-new-10-year-roadmap

WHO Eastern Mediterranean Regional Office (n.d.), "Zoonotic disease: emerging public health threats in the Region", Cairo. Available at: https://www.emro.who.int/en/about-who/rc61/zoonotic-diseases.html

WHO and GARDP (2024), "Policy and regulatory interventions to address antibiotic shortages in low and middle-income countries", Geneva, Switzerland. Available at: https://iris.who.int/server/api/core/bitstreams/887aa213-a718-4136-b5ae-bf183e163ac0/content

WHO and UNICEF (2019), *WASH in health care facilities: global baseline report 2019*, Geneva, Switzerland. Available at: https://reliefweb.int/report/world/wash-health-care-facilities-global-baseline-report-2019

WOAH and World Bank (2024), *Forecasting the Fallout from AMR: Economic Impacts of Antimicrobial Resistance in Humans*, Paris and Washington, DC. Available at: https://www.woah.org/app/uploads/2024/09/forecasting-fallout-amr-economic-impacts-antimicrobial-resistance-humans-27924-compressed.pdf

World Bank (2017), *Drug-Resistant Infections: A Threat to Our Economic Future*, Washington, DC. Available at: https://documents1.worldbank.org/curated/en/323311493396993758/pdf/final-report.pdf

World Bank (2018), *One Health: Operational Framework for Strengthening Human, Animal, and Environmental Public Health Systems at their Interface*, Washington, DC. Available at: https://documents1.worldbank.org/curated/en/961101524657708673/pdf/122980-REVISED-PUBLIC-World-Bank-One-Health-Framework-2018.pdf

World Bank (2019), *Pulling Together to Beat Superbugs: Knowledge and Implementation Gaps in Addressing Antimicrobial Resistance*, Washington, DC. Available at: https://documents1.worldbank.org/curated/en/430051570735014540/pdf/Pulling-Together-to-Beat-Superbugs-Knowledge-and-Implementation-Gaps-in-Addressing-Antimicrobial-Resistance.pdf

World Bank (2021), *Landscape Analysis of Tools to Address Antimicrobial Resistance*, Washington, DC. Available at: https://thedocs.worldbank.org/en/doc/e9d15ce04da6b28e0013dfca2cd2426f-0140012021/original/Landscape-Analysis-of-Tools-to-Address-AMR-Circulation-Copy-May-13-2021.pdf

World Bank (2024), *Stopping the Grand Pandemic: A Framework for Action Addressing Antimicrobial Resistance through World Bank Operations – Summary Report*, Washington, DC. Available at: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099050724083015872/p17446410f60aa01d1b9d3185a333f20bef

World Bank and WHO (2022), *Sustaining Action Against Antimicrobial Resistance: A Case Series of Country Experiences*, Washington, DC. Available at: https://openknowledge.worldbank.org/entities/publication/03b2beaa-57bd-54d0-b2d7-8ae8fed99ba2

V. Zanichelli, M. Sharland, B. Cappello, L. Moja, H. Getahun, C. Pessoa-Silva, H. Sati, C. van Weezenbeek, H. Balkhy, M. Simão, S. Gandra and B. Huttner (2023), "The WHO AWaRe (Access, Watch, Reserve) antibiotic book and prevention of antimicrobial resistance", *Bulletin of the World Health Organization*, 101(4): 290-296. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC10042089

1912 EBRD engagement in global efforts to curb antimicrobial resistance (AMR)