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

Annex 2

The AMR-climate change-biodiversity loss nexus

The WHO considers AMR to be a key global health issue.[100] 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.[101]

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.[102] Biodiversity is adversely affected by anthropogenic impacts and climate change.[103] The links between AMR and biodiversity loss may manifest in soil microbial diversity, which is an essential shield against the spread of AMR,[104] as well as a main source of pharmaceutical discoveries, such as antimicrobial drugs.[105] Ancient evidence reveals that current warming is occurring at roughly 10 times the average rate of warming since the last ice age.[106] One million animal and plant species are now threatened with extinction, many within decades, more than ever before in human history.[107] 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.[108]

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.[109] Storms and floods, the frequency and severity of which are intensified by

[100] See WHO (2023).
[101] See Herron (2022).
[102] See Fleming Fund (2023).
[103] See Jaureguiberry et al. (2022).
[104] See Klümper et al. (2024).
[105] See Thiele-Bruhn (2021).
[106] See NASA (n.d.).
[107] See United Nations (2019).
[108] See WHO (2023).
[109] See San Lio et al. (2023).

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.[110] 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.[111]

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.[112] 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.[113]

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.[114] This type of cross-species disease transmission is thought to have triggered the Covid-19 pandemic.[115]

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.[116] Melting permafrost due to rising temperatures can unlock gases, such as carbon dioxide and methane, as well as ancient viruses and bacteria.[117] Scientists report that melting Arctic glaciers produce conditions for algae to bloom, turning sun-reflecting glaciers into sun-absorbing hotspots.[118] These, in turn, have ecosystem and geo-planetary impacts, worsening their remaining natural carbon sink function, as well as potentially increasing methane production.[119]

[110] See Manzoor and Adesola (2022).
[111] See Larsson and Flach (2021).
[112] See Environmental Resilience Institute (n.d.).
[113] See Keesing et al. (2010).
[114] See WHO Eastern Mediterranean Regional Office (n.d.).
[115] See WHO (2020).
[116] See Timmis (2021).
[117] See Denchak (2018).
[118] See McDougall (2019).
[119] See Topp and Pattey (1997).

Intensive use of antibiotics in livestock production (which accounts for approximately 70 per cent of global sales),[120, 121] as well as biocides and heavy metals, which can remain in the environment, may reduce microbial biodiversity and induce AMR in bacteria.[122]

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.[123] 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.[124]

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,[125] the Jeddah Commitments to Accelerate Actions on AMR of 16 November 2024[126] 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 2025. 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.

[120] See Jonas et al. (2017).
[121] See Tiseo et al. (2020).
[122] See Larsson and Flach (2021).
[123] See WOAH and World Bank (2024).
[124] See WHO (2016).
[125] See UNGA-HLM (2024a).
[126] See United Nations (2024).