

Bracing for Superbugs

Strengthening environmental action
in the One Health response to
antimicrobial resistance



© 2023 United Nations Environment Programme
ISBN: 978-92-807-4006-6
Job number: DTI/2504/GE

This publication may be reproduced in whole or in part and in any form for educational or non-profit services without special permission from the copyright holder, provided acknowledgement of the source is made. The United Nations Environment Programme would appreciate receiving a copy of any publication that uses this publication as a source.

No use of this publication may be made for resale or any other commercial purpose whatsoever without prior permission in writing from the United Nations Environment Programme. Applications for such permission, with a statement of the purpose and extent of the reproduction, should be addressed to the Director, Communication Division, United Nations Environment Programme, unep-communication-director@un.org.

Disclaimers

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Mention of a commercial company or product in this document does not imply endorsement by the United Nations Environment Programme or the authors. The use of information from this document for publicity or advertising is not permitted. Trademark names and symbols are used in an editorial fashion with no intention on infringement of trademark or copyright laws.

The views expressed in this publication are those of the authors and do not necessarily reflect the views of the United Nations Environment Programme. We regret any errors or omissions that may have been unwittingly made.

© Maps, photos and illustrations as specified

Suggested citation: United Nations Environment Programme (2023). *Bracing for Superbugs: Strengthening environmental action in the One Health response to antimicrobial resistance*. Geneva

Production: United Nations Environment Programme

URL: <https://www.unep.org/resources/superbugs/environmental-action>

Executive Summary

Antimicrobials have been essential in reducing the burden of infectious disease in humans, animals and plants for decades. However, their effectiveness is now in jeopardy because several antibiotic, antiviral, antiparasitic and antifungal treatments no longer work because of antimicrobial resistance or AMR.

The World Health Organization considers AMR in humans and animals to be one of the top ten threats to global health. Estimates suggest that by 2050 up to 10 million deaths could occur annually affecting economies and shifting more people into poverty. If not dealt with, AMR could also significantly affect agricultural production, again affecting economies and food security, and low-income and lower middle-income countries will bear most of the burden.

Global attention to AMR has mainly focused on human health and agriculture sectors, but there is growing evidence that the environment plays a key role in the development, transmission and spread of AMR. The environmental dimensions of AMR are complex and characterized by dynamic interactions, cyclic interrelationships, complexities and multiple causalities and dynamics in multi-dimensional media that impact global planetary health.

AMR can occur naturally or can be acquired. Increased use and misuse of antimicrobials and other microbial stressors, such as pollution, create favourable conditions for microorganisms to develop resistance both in humans and the environment from sources such as sewage. Bacteria in water, soil and air for example can acquire resistance following contact with resistant microorganisms.

The environmental dimensions of AMR include pollution from hospital and community wastewater, effluent from pharmaceutical production, run-off originating from plant and animal agriculture and other forms of waste and releases. These matrices may contain not only resistant microorganisms, but also antimicrobials, various pharmaceuticals, microplastics, metals and other chemicals, which all increase the risk of AMR in the environment. Polluted waterways, particularly those that have been polluted for some time, are likely to harbour microorganisms that increase AMR development and distribution in the environment. With increasing pollution and lack of management of sources of pollution, combined with AMR in clinical and hospital settings and agriculture, risks are increasing.

The key economic-sectors contributing to the environmental dimensions of AMR can be broadly classified as: pharmaceutical and other chemical manufacturing and uses including a range of different chemicals, such as antibiotics, antivirals and fungicides as well as disinfectants; agriculture including animal production, aquaculture, food crops or those providing inputs such as feed, textiles, ornamental plants, biofuels and other agricultural commodities; healthcare delivery in hospitals, medical facilities, community healthcare facilities and in pharmacies where a broad range of chemicals and disinfectants may be used.

While the relationship between environmental pollution and AMR and the reservoir of resistance genes in the environment has been established, the significance and its contribution to AMR globally is still unclear. Even so, there is enough knowledge to implement measures to reduce the factors that influence AMR from an environmental perspective; this will also address the triple planetary crisis by addressing sources, sinks and waste.

Using the 'One Health' approach, which recognises that the health of people, animals, plants and the environment are closely linked and interdependent, can successfully address AMR. Some countries have already adopted this approach and have included environmental-related aspects into their National Action Plans on AMR. Agriculture, health and environmental agencies have in place many policy and regulatory frameworks and controls addressing some of the drivers and factors with an impact on environmental dimensions of AMR. Voluntary industry initiatives have established a common framework for managing discharge of antimicrobial compounds and apply it across manufacturing and supply chains among their members. International organizations and bodies are taking decisions and have initiatives such as the joint efforts of the Quadripartite Alliance (FAO, UNEP, WHO and WOAH) for strong and coordinated action.

Yet still more needs to be done.

This report calls for priority action to address key pollution sources from poor sanitation, sewage; community and municipal wastes; healthcare delivery; pharmaceutical manufacturing; intensive crop, and terrestrial and aquatic animal production sectors. There are many co-benefits of preventing and managing pollution in these sources to address biological wastes that contain resistant microorganisms that spread AMR, and chemical wastes that select for AMR. To prevent and reduce such pollutants it is crucial to:

- create robust and coherent national level governance, planning, regulatory and legal frameworks, as well as establish coordination and collaboration mechanisms
- increase global efforts to improve integrated water management and promote water, sanitation and hygiene to limit the development and spread of AMR in the environment as well as to reduce infections and need for antimicrobials
- increase integration of environmental considerations into National Action Plans on AMR, and AMR into environmental-related plans such as national chemical pollution and waste management programmes, national biodiversity and climate change planning
- establish international standards for what are good microbiological indicators of AMR from environmental samples, which can be used to guide risk reduction decisions and create effective incentives to follow such guidance
- explore options to redirect investments, to establish new and innovative financial incentives and schemes, and to make the investment case to guarantee sustainable funding, including the allocation of sufficient domestic resources for tackling AMR.

Prevention is at the core of the action and environment is a key part of the solution. Implementing comprehensive and coordinated strengthening of environmental action in the 'One Health' response to AMR will not only help reduce the risk and burden of AMR on societies but will also help address the triple planetary crisis.



United Nations Avenue, Gigiri
P O Box 30552, 00100 Nairobi, Kenya
Tel +254 720 200200
unep-info@un.org
www.unep.org