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MAPPING THE AMR ECOSYSTEM

The AMR ecosystem is a complex network of interconnected parts including, for example, institutions, organisations, people, policies, projects, and issues related to AMR in a country. It also includes gender, social, political, and economic factors that affect people's beliefs and behaviours, which influence how AMR develops, and that impact on human, animal, and environmental health. Understanding your AMR ecosystem allows you to identify what exists in the AMR landscape that you can engage in the Responsive Dialogues process. It also allows you to identify gaps and challenges that might point to key issues to focus on.

This module provides guidance on the following:

- Why map the AMR ecosystem?
- How to map the AMR ecosystem?
- How to organise the information?
- How to monitor AMR ecosystem mapping?

NOTE

Your project might have already started mapping the AMR ecosystem. Use and build on this, and keep updating the research.

Why map the AMR ecosystem?

Understanding what and who is part of the AMR ecosystem provides an insight into the reality of our interconnected world, instead of just thinking about one thing causing another, as in a simple chain.

The objectives, scope, and context of the Responsive Dialogues project determine the focus and parameters of your AMR mapping exercise – be it at a local, district, or national level. Your aims are to gain an understanding of the following:

- **Existing work relating to AMR in your context**. For example, the systems and institutions already involved, such as the healthcare system, the pharmaceutical industry, agriculture and veterinary practices, regulatory bodies, research institutions, and public awareness campaigns.
- **Actors and stakeholders for Responsive Dialogues.** For example, healthcare providers, policy-makers, governmental officials, researchers, international organisations, funders, the private sector, agriculture and veterinary sectors, civil society and community organisations, patient advocacy groups, and the media. See Module 2 for more on stakeholders.
- **Potential communities and participants for Responsive Dialogues**. For example, community groups and civil society organisations (CSOs). See Module 3 for more on the community.

- **Social, cultural, political, economic, and environmental factors**. For example, all the factors that may affect people's experiences, attitudes, and behaviours that influence how AMR develops.
- **One Health.** For example, the links in your context between human, animal, and environmental health, and how the different parts influence each other and create a dynamic whole. See *Cross-cutting themes* for more on AMR and One Health.

It's really important to understand the 'whole picture', so that you know what to take into account to facilitate the co-creation of relevant solutions to address AMR challenges.

How to map the AMR ecosystem?

Multiple parties might be involved in helping to map the AMR ecosystem. Collaboration between these parties can lead to a more comprehensive and accurate assessment of the ecosystem. However, the core implementation team starts the process in the groundwork phase, and continues to lead this ongoing task as more people are involved and more information is gained.

Many different approaches could be used in the mapping task. Below are a few examples that can be used to gain rich insights into existing work on AMR and related topics, the actors, networks, and their relationship to AMR, problems and issues, stories, experiences, and perceptions.

BACKGROUND RESEARCH	
Data collection and analysis	**How to use the data**
Gather data from multiple sources about existing work, initiatives, and institutions relating to AMR. Review scientific literature and research papers, policy documents, databases, interviews, surveys, and case studies.	Analyse the data to identify trends, gaps, and areas of concern, for example, antibiotic usage patterns, resistance patterns, regulatory frameworks, surveillance systems, and public awareness initiatives. Build a comprehensive understanding of the AMR ecosystem in your context. Identify what exists to build on. Identify missing information which might point to key issues to focus the Responsive Dialogues on.
Analyse research and innovation	**How to use the data**
Review research initiatives and projects focused on AMR in your context. Assess the level of funding, collaboration, and translation of research into policies and practices.	Identify gaps in research priorities and in the dissemination of research findings.

Analyse surveillance data	How to use the data
Analyse available surveillance data on antimicrobial use and resistance patterns.	Identify trends, hotspots, and areas where resistance rates are high or increasing. Assess if surveillance systems are comprehensive, timely, and include data from different sectors (including One Health).
POLICY ANALYSIS/REGULATIONS	
Review policies and guidelines	How to use the data
Review policies and regulations related to AMR in your country/context to understand the objectives, strategies, and action plans outlined in these documents. Evaluate the implementation of existing AMR policies and assess if the policies are being effectively translated into action at various levels. Assess the regulatory framework surrounding antimicrobial use, availability, and distribution.	Assess the strengths of these policies, as well as their implementation and enforcement mechanisms. Identify weaknesses and barriers of policies and regulations, such as lack of resources, co-ordination issues, or limited enforcement mechanisms. Identify gaps in regulation, monitoring, and enforcement. Evaluate if regulations align with international standards and best practice. Identify areas where policy recommendations may be needed.
STAKEHOLDER MAPPING (see the examples from the Responsive Dialogues projects)	
Consult, interview, and/or conduct surveys with AMR stakeholders/actors	How to use the data
Collaborate with stakeholders across sectors. Engage in dialogues, workshops, and consultations with stakeholders to gain a comprehensive understanding of the AMR ecosystem.	Understand who and where the stakeholders are – roles, interactions, and relationships. Gather diverse viewpoints, insights, and perspectives, for example, on existing policies, implementation challenges, and potential gaps. Understand the dynamics and potential collaborations among stakeholders so as to facilitate effective stakeholder engagement. Identify gender and power dynamics in the factors affecting AMR.
EVALUATE HEALTHCARE PRACTICES	
Infection prevention and control	How to use the data
Assess the implementation of infection prevention and control practices in healthcare facilities. Look for gaps in hand hygiene, appropriate antibiotic prescribing, and adherence to guidelines.	Evaluate the availability of resources, training programmes, and support for healthcare professionals.
Assess antibiotic stewardship	How to use the data
Evaluate the implementation of antibiotic stewardship programmes in different healthcare settings. Determine if there are policies, protocols, and education programmes in place to promote responsible antibiotic use.	Identify barriers to implementing stewardship practices effectively.

Consider public awareness and education	How to use the data
Evaluate the level of public awareness and education regarding AMR in your context. Assess the effectiveness of communication campaigns, educational materials, and initiatives aimed at promoting responsible antibiotic use and hygiene practices.	Identify gaps in public engagement and education efforts.
CONSIDER INTERNATIONAL COMMITMENTS	
Review international agreements	**How to use the data**
Research the agreements your country or organisation has made regarding AMR.	Assess progress made in meeting these commitments. Identify any gaps in implementation or co-ordination with international efforts.
SYSTEMS THINKING	
Apply a systems thinking approach	**How to use the data**
Explore how changes in one component of the system can impact other components and overall AMR dynamics.	Understand the interdependencies and feedback loops within the AMR ecosystem. Identify leverage points and opportunities for intervention.

Examples from Responsive Dialogues projects

In the **Zambia** project, the AMR ecosystem was mapped by desk review which identified and summarised stakeholders that were key members in creating Zambia's NAP on AMR. Meetings were held with these organisations, which identified more organisations.

In the **Malawi** project, the groundwork involved early consultation meetings with the National AMR Coordinating Unit at the Malawi Ministry of Health. These initial steps allowed the project to explore what AMR initiatives, policies, and national actions existed, and to establish connections with various stakeholders and actors involved. Initially, 30 stakeholders were identified. A further 22 were recruited through snowballing (asking stakeholders if there were any other individuals or organisations to include), making a total of 52 participants. These included representatives across the One Health spectrum.

Due to the second wave of COVID-19, individual conversations were held with 43 individuals. These were either in-person or over the telephone, based on the participant's preferences. Most participants preferred to have in-person conversations. The conversations explored:

- Stakeholders' knowledge about AMR
- Their understanding of drivers and consequences of AMR in Malawi
- Existing AMR activities in Malawi
- Key messages stakeholders felt should be communicated, to which participant groups, and in what medium
- Potential interventions to address AMR in Malawi.

The interviews allowed the project to discover in greater detail existing AMR activities, their objectives, who was involved, impacts, challenges, other interventions that could be done, and what stakeholders thought of Responsive Dialogues. This exercise was key to understanding if and how the project could contribute to the ongoing AMR work, and generated useful insights into critical issues that could be exploited.
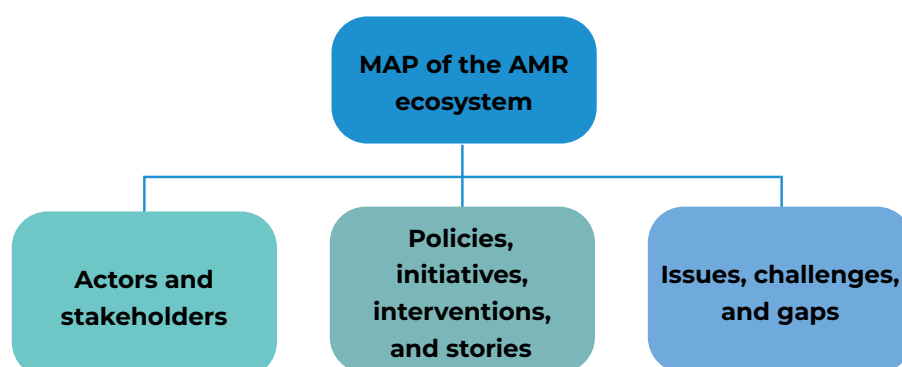
NOTE

If you have any difficulties finding national AMR policies, frameworks and action plans online, reach out to relevant government departments or agencies for assistance in obtaining these documents. See Section 6 for the suggestions, *How to find AMR policies, frameworks, and action plans.*

How to organise the information?

Organising information in a structured way helps to reveal connections and patterns within the complex AMR ecosystem. Creating visual maps and diagrams can help to reveal the relationships between various stakeholders, issues, initiatives, and challenges. Here's an example of how to organise information related to AMR into different broad categories:

MAP of the AMR ecosystem

Actors and stakeholders

Policies, initiatives, interventions, and stories
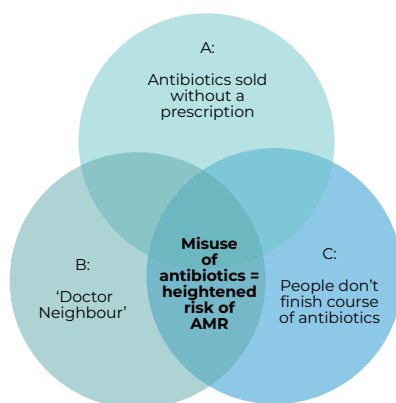
Issues, challenges, and gaps

Mapping methods and techniques

Various mapping methods can be used to understand the AMR ecosystem. Each of these offers a unique perspective on understanding the complexities of AMR, as well as what and who exists in the ecosystem. Here is how each method can be used:
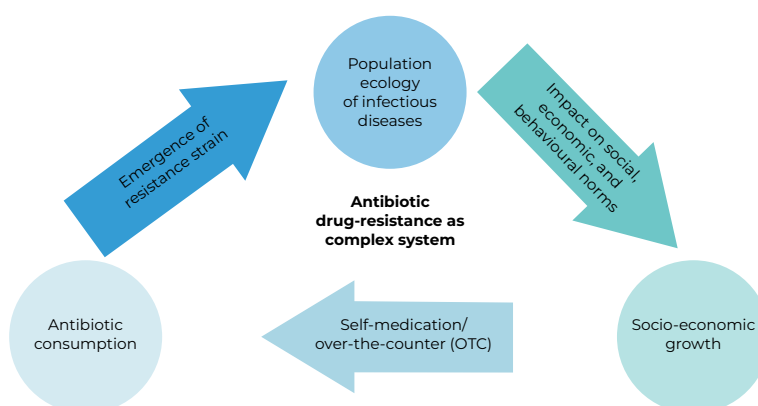
Issue maps: These are helpful for visualising the different issues, challenges, and causes related to AMR. Venn diagrams can illustrate overlapping problems, while geographic distribution maps can show where AMR is most prevalent. This approach helps identify common factors driving AMR and possible areas of focus for Responsive Dialogues.

Example of a Venn diagram

A:
Antibiotics sold without a prescription

B:
'Doctor Neighbour'

Misuse of antibiotics = heightened risk of AMR

C:
People don't finish course of antibiotics

Causal maps: These include, for example, problem trees or causal-loop diagrams that can provide a deeper understanding of the relationships between different components within the AMR ecosystem. Problem trees help identify root causes and their effects, while causal-loop diagrams show feedback loops that contribute to the complex dynamics of AMR. Again, this approach helps to identify possible areas of focus for Responsive Dialogues.

Example of a causal map

Population ecology of infectious diseases

Emergence of resistance strain

Impact on social, economic, and behavioural norms

Antibiotic drug-resistance as complex system

Antibiotic consumption

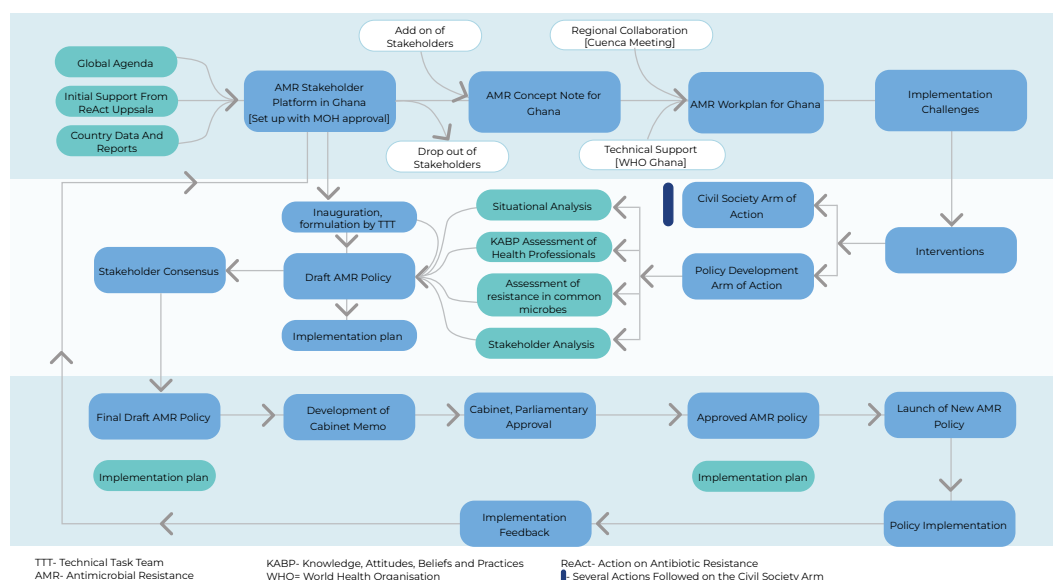Self-medication/ over-the-counter (OTC)

Socio-economic growth

Source: Malik, B., Bhattacharyya, S. Antibiotic drug-resistance as a complex system driven by socio-economic growth and antibiotic misuse. Sci Rep 9, 9788 (2019). https://doi.org/10.1038/s41598-019-46078-y

Stakeholder maps: These help you visualise the various organisations, institutions, and individuals involved in the AMR landscape. They highlight relationships, collaborations, and the influence of different actors in shaping AMR-related behaviours and outcomes. They are especially important and useful for identifying the different types of stakeholders to engage in Responsive Dialogues. See Module 2 for stakeholder engagement and for an example of a stakeholder map.

Timelines: These offer a chronological view of the evolution of AMR-related issues – at the global, regional, national, and local level. This approach helps to track the progression of AMR awareness, policy changes, scientific discoveries, and public responses over time, revealing trends and shifts.

Information flow maps: Mapping information flows between different actors and stakeholders can shed light on how knowledge and awareness about AMR are communicated. This is particularly useful for understanding how the flow of information affects behaviours and decision-making processes related to AMR and antibiotic use.

Example of an information flow map

TTT- Technical Task Team
AMR- Antimicrobial Resistance

KABP- Knowledge, Attitudes, Beliefs and Practices
WHO= World Health Organisation

ReAct- Action on Antibiotic Resistance
- Several Actions Followed on the Civil Society Arm

Source: www.mdpi.com/antibiotics/antibiotics-11-00613/article_deploy/html/images/antibiotics-11-00613-g002.png

Mapping tips

- **Identify the focus:** Determine the specific aspect of AMR you want to map, for example, issues, stakeholders, causal relationships, timelines, or information flows.

- **Gather data and input:** Collect information from various sources, including experts, stakeholders, research studies, and existing data. Involve diverse perspectives to ensure a comprehensive and inclusive understanding.

- **Choose mapping tools:** Select appropriate mapping tools based on your focus. Use software or tools that allow you to create diagrams, charts, and visual representations effectively.

- **Visualise the connections:** Map the connections, relationships, and patterns based on the chosen approach. Use shapes, lines, colours, and labels to represent different elements.

- **Engage stakeholders:** Involve different stakeholders throughout the mapping process. Their insights and interpretations will enrich the maps and provide a well-rounded perspective.

- **Analyse insights:** Analyse the completed maps to identify key insights, trends, feedback loops, and potential intervention points.

- **Communicate findings:** Share the visual maps and their insights with stakeholders, decision-makers, and the public to gain further insights and foster understanding and support for AMR-related initiatives.

AMR ecosystem mapping in Responsive Dialogues enables you to gain a holistic understanding of what exists in the AMR landscape in your context, what is effective in responding to the challenges of AMR, and where there are gaps. These insights allow you to work with others in the AMR landscape to find locally relevant and feasible solutions to inform strategic interventions and policies that effectively address this critical global health challenge.

How to monitor AMR ecosystem mapping?

The example criteria below may help your project monitor your AMR ecosystem mapping on an ongoing basis as you gather more information. They are also a useful reminder of the important aspects to accomplish in the mapping exercise.

- Check the focus of the AMR mapping against project objectives, scope, and context
- Check that you have gathered information from diverse sources to ensure comprehensive and inclusive understanding
- Select appropriate mapping tools
- Identify visual tools to help show connections, relationships, and patterns
- Engage stakeholders in an ongoing way in the mapping process
- Communicate findings from the mapping to stakeholders and others involved.

Checklist of guidance in this module

Tick completed activities/tasks and those that still need completion.

Activities	Yes	To do
The importance of mapping the AMR ecosystem for successful Responsive Dialogues is understood		
Approaches for mapping the AMR ecosystem are identified		
Data collected to identify what exists and where there are gaps is organised		
Different techniques are used to organise the information collected to feed into Responsive Dialogues		
AMR ecosystem mapping (ongoing) is monitored and tracked		